A

DICTIONARY

OF

THE ECONOMIC PRODUCTS OF INDIA.

BY

GEORGE WATT, M.B., C.M., C.I.E.

REPORTER ON ECONOMIC PRODUCTS WITH THE GOVERNMENT OF INDIA.
OFFICIER D'ACADÉMIE; FELLOW OF THE LINNEAN SOCIETY; CORRESPONDING MEMBER OF THE ROYAL HORTICULTURAL SOCIETY, ETC., ETC.

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IN SIX VOLUMES

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[Tectona to Zygophillum.]



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DICTIONARY

OF

THE ECONOMIC PRODUCTS OF INDIA.

Teal, see Ducks, Teals, etc., Vol. III., 196.

TECOMA, *Juss.; Gen. Pl., II., 1044.*

Tecoma undulata, *G. Don.; Fl. Br. Ind., IV., 378;* BIGNONIACEÆ. 227

Syn.—T.? GLAUCA, *DC.;* BIGNONIA UNDULATA, *Smith;* B. GLAUCA, *Dcne.;* TECOMELLA UNDULATA, *Seem.*

Vern.—*Rugtrora*, HIND.; *Rohira, roir, lahúra, lúár*, PB.; *Regdáwan, reodán, rebdún, rebdan, raidawan*, PUSHTU; *Roira*, MERWARA; *Lohira, lohúri, lahéro, khen*, SIND; *Roira, lohuri, lohero, rakht-reora, rugtrora*, BOMB.; *Rakht reora*, MAR.

References.—*Roxb., Fl. Ind., Ed., C.B.C., 492; Brandis, For. Fl., 352; Gamble, Man. Timb., 275; Dalz. & Gibs., Bomb. Fl., 161, Stewart, Pb. Pl., 149; Murray, Pl. & Drugs, Sind, 177; Birdwood, Bomb.* [illegible]

[illegible]

GUM. 228

[illegible] in Sind

MEDICINE. Bark. 229

FODDER. Foliage. 230

[illegible] brown, close-grained, mottled with lighter streaks; weight 44lb per cubic foot [illegible]

TIMBER. 231

TECTONA, *Linn.; Gen. Pl., II., 1152.*

Tectona grandis, *Linn.; Fl. Br. Ind., IV., 570;* VERBENACEÆ. 232

THE TEAK TREE.

Vern.—*Ságún, segun, sákhú*, HIND.; *Según*, BENG.; *Soguna*, SANTAL;

AREA under TEAK. 233

which Anin, east
is the most com-

Meinam rivers.

"It is estimated that the teak plantations of Burma, when mature,

aggregate of 22 tons, or 1,100 cubic feet of timber. Most of these trees,

much more rapidly at first than seedlings. This great power of reproduction is another point which favours teak in its struggle for existence against other trees, for most teak seedlings which come up naturally are cut down to the ground by the jungle fires of the hot season; some are killed, but many sprout again during the rains; and, though they are cut down repeatedly by the fires of successive seasons, yet, meanwhile, the root-stock increases in size every year by the action of the shoots which come up, and, at last, often after the lapse of many years, it produces a shoot strong enough to outlive the fire. Thus, in many cases, what appears

TECTONA grandis.

Area under Teak

AREA under TEAK.

a seedling plant of teak is really a coppice shoot from a thick gnarled root-stock, bearing the scars of successive generations of shoots, which are burned down by the annual fires. The coppice shoots of teak attain a large size, and form good serviceable timber."

An idea of the importance of the various forests may perhaps be best gained by a short consideration of the outturn (as far as that can be ascertained from the Annual Reports of the Forest Department) during the past year—1888-89.

Burma. 234 **Burma.**—The quantity of teak timber, worked out of British forests in Lower Burma, amounted to 53,236 tons. In the Tenasserim Circle 12,081 tons were extracted, or 2,245 tons more than in 1887-88. Besides this a large quantity was on its way to, but had not reached, the depôt when the year closed. The outturn in the Pegu Circle was 43,174 tons against 30,700 tons in 1887-88, and would have been larger had there not been much timber neaped *en route* to Rangoon, owing to the early closing of the rains. The total area of plantations, a large proportion of which was under teak, amounted in the Pegu Circle to about 2,000 acres; in the Tenasserim Circle 4,670 acres were under teak plantation on 31st March 1889. The exports from Rangoon amounted to 62,969 cubic tons (tons of 50 cubic feet), valued at R48,99,547; from Moulmein they were 93,465 cubic tons, valued at R77,21,819. A very large proportion of these exports were derived from Upper Burma.

The teak forests of Upper Burma are the most extensive and most important commercially of any under our possession. For many years previous to the last Burmese war they were leased by the Bombay Burma Trading Company from the Government of the late King. On the annexation of the kingdom, the Corporation claimed not only to hold leases stretching over a very large extent of country, but also to be entitled, under promises from the Government of the late King, to renewals of such leases after the expiration of the existing periods. The terms under which they held these leases involved the right of girdling and extracting as much timber as they could remove in return for the payment of a fixed rental for each forest tract. In August 1888 articles of agreement were drawn up by which licenses were granted to the Corporation to work, as contractors for the Government, seven forest tracts (of which they held leases from the King of Burma), for periods extending to 1904. This agreement provided for the extraction of a minimum quantity of timber during the continuance of the contracts and for the payment of a royalty at rates varying from R5 to R10 per ton. It was further provided that the forests should be subject to the rules and regulations of the Forest Department, and that all girdling should be carried out by, or under the direction of, officers of that Department. Similar conditions were made with the more important Burman lease-holders. The royalty thus charged represents at present the chief source of revenue to the Department from Upper Burma, but a minor income is obtained from local traders for trees felled for use in the vicinity, and from fees imposed on the extraction of general forest produce.

The amount of teak removed from the forests of Upper Burma in 1888-89 was:—by Government agency, 97,361 cubic feet; by purchasers 6,872,551 cubic feet, and by free grantees, 4,464 cubic feet, or a total of 6,974,366 cubic feet (about 139,500 tons). This represents a very large increase on the total of 1887-88, which was 78,379 tons. Mr. Hill, Conservator of the Circle, in his report for the year, notes on the great damage done by fire, and the difficulties met with in attempts at fire conservation. He states that owing to this cause, natural reproduction is everywhere in a most unsatisfactory state; "not only are the younger classes of tree ill

represented, but seedlings are scarcely to be found." But, as the work of the Forest Department progresses, when reserves have been extended and the limits of the permanent forest area have become definitely known, protection from fire on a large scale will doubtless be the first and most important measure to be instituted, and a great improvement in the existing state of matters may be looked for. (*Report on Forest Administration, Upper Burma, 1888-89.*) AREA under TEAK.

Bombay.—In comparison with the vast teak forests of Burma, those of other parts of the Indian empire are very unimportant. But in Bombay much teak is produced, and timber of a quality that at least holds its [illegible] Bombay. 235

teak in Bombay. This is prevented by want of space, so the reader [illegible]

Madras. 236

felled.

Central Provinces.—In the Forest Department Reports for these provinces teak and *sál* (**Shorea robusta**) timber are considered under one heading. It is, therefore, impossible to give even an approximation to the amount annually collected of either. It may, however, be stated that the total yield of the two during the past year (1888-89) from Government forests was 198,808 cubic feet, or 3,976 tons. Central Provinces. 237

Assam.—In this province teak is extremely unimportant. In 1888-89 the outturn amounted to only 180 cubic feet in the form of teak poles [illegible] Assam. 238

Bengal. 239

derable success, to start plantations in the *Andaman Islands.* Andamans. 240

CLIMATE.—Teak thrives best i [illegible] Climate. 241
during winter of from 60° to 80° F
during the rains, 77° to 87°, and du
annual temperature which suits it be
But it can withstand temperatures

AREA under TEAK.

states, that on the Anamally mountains, it grows to perfection as high as 2,500 feet, and in certain localities up to 4,000 feet, though of poor growth above 3,000 feet. In Burma it grows up to 3,000 feet (*Kurz*), an observation confirmed—in the case of the Shan States—by Mr. Aplin. As regards moisture, teak thrives best under a mean annual fall of 50 to 120 inches, and requires a rainfall of at least 30 inches to grow at all.

Soil. 242

SOIL.—The tree grows well on a great variety of soils, but shows a decided preference for certain descriptions. It thrives on sandstone, limestone, and granite, and, in some of the valleys of the Khandesh Dangs, grows to great perfection on soil produced by the disintegration of basaltic rocks. The trees in the Nelambur plantation of Madras were found to succeed on hills of gneiss, while several laterite hills included in 1855-56 were found to be quite unsuitable—the attempt to plant on them failed signally. Brandis writes, "We find teak on light and sandy soils, as well as on those which are binding and heavy. But under all circumstances there is one indispensable condition—perfect drainage and a dry subsoil. To the absence of perfect drainage I ascribe the circumstance that teak does not seem to thrive on level ground with alluvial soil. Instances of natural teak forests in such localities are found on the head-waters of the Sieling and Domdamee rivers in Martaban, in the lower Boonee forests, and in some other places in the plains of Pegu. In such soil the teak grows freely and more rapidly than on the hills; but the trunks are irregular, fluted, and ill shapen; while on the adjoining hills the tree habitually forms tall, clean cylindrical stems."

Environment. 243

ENVIRONMENT.—Teak, like the oak in Europe, rarely forms natural pure forests. When a pure forest does exist it is generally met with on alluvial soils, in which the growth of the teak is unusually free and rapid, a fact which gives it an advantage over competing vegetation. The best teak forests are those in which bamboos or ordinary dry forest trees are found. Thus in the better localities of Burma, teak is estimated to constitute only one-tenth of the whole forest, but the proportion varies greatly; in certain instances it may form 50 per cent., in others scarcely 1 per cent. of the trees in the forest. It is hardly ever found in forests of Shorea robusta and but rarely in the *In* (Dipterocarpus tuberculatus) forests of Burma. Nor is it met with in the dense evergreen forests of Burma and the Western Ghats. It is in fact a light-loving tree, and room overhead, and free circulation of air are necessary to its satisfactory growth. Sir D. Brandis, in a letter to the Bombay Government, on the subject of teak-planting, in 1879, strongly insisted on this point, and advocated that the whole area to be planted should not be covered with teak, but that cleared bands at certain distances should be planted between belts of jungle.

Cultivation. 244

CULTIVATION.—Under favourable circumstances as to climate, soil, and environment, teak forests require little attention save in supervising felling, and in strict fire conservancy. The latter is especially necessary owing to the time of seeding of the tree, which flowers during the rains, in July and August, and ripens its seed between November and January. "One of the greatest obstacles," writes Brandis, "to the spread of the teak is the circumstance that the seed ripens and falls to the ground at the commencement of the hot season, before the annual fires pass through the forest. The tree produces seed at an early age and generally seeds freely and regularly every year; but a larger portion of the seeds are destroyed by the fires, and of those which escape numbers are washed away, in the hills at least, by the first torrents of the monsoon." It has been argued, from the difficulty of getting the seed to germinate in nurseries, that the hard outer covering is destroyed by the periodical fires

AREA under TEAK CULTIVATION

in natural forests, and thus allows germination to take place; but experiments conducted in Madras, at the Conolly plantations, shew that even a slight application of fire destroys the vitality of the seed at once.

Plantation. 245

The oldest and largest teak plantation in India is that at Nelambur in Malabar, called after the late Mr. Conolly, Collector of the District, who commenced it in 1844. A short account of the history of this plantation

which have vanished from private carelessness and rapacity—a work too new, too expensive, and too barren of early return to be ever taken up by the Native proprietor." Land well suited as to climate and geological composition was secured by Government, and planting, commenced in 1844, was steadily carried on, till, in 1874, 2,730 acres were under the tree.

and rotten straw.
and July 1844, 50
memorandum quote
R2,29,000, of which
leaving the cost at R
were—at 10 years,
enters into elaborat

that "eventually the result of the plantation must be to contribute to the *wants of the country an immense stock of useful material, realising such a* revenue as fully to reimburse the State for their outlay, even after compound interest for the unproductive period is allowed. Sir D. Brandis, as already stated, considers that a mistake has been made in the case of this plantation, in forming a pure teak forest, since teak, in its natural state, does not grow alone, but is associated with bamboos and a variety of other trees. Gamble appears to agree with this opinion, as is shown by the following passages: "No safe speculations can be formed regarding the future of a pure teak forest such as that of Nilambur; it is impossible to foresee the risk of damage by storms, insects, disease, or other causes to which pure teak forest may be exposed. It may be doubted whether,
of trees 85 years
(1881) stocked at
th a full crop on

whose experience is therefore great, may be of value:—

Seed. 246

"SEED.—Collect seed from trees with a clear stem, free from decay and of vigorous growth; February is the best month to collect in."

AREA under TEAK CULTIVATION

Nursery Beds. 247

"PREPARATION OF NURSERY BEDS,—Select good free soil, dig 12 inches deep, removing weeds, roots, and stones; when caked, the soil should be reduced to a fine mould and the nursery levelled; line off beds 3½ feet wide and one foot space betwixt each bed and its fellow, thenr aise an outer edging round each bed 3 to 4 inches high; beds when thus finished will be about 2½ feet wide between the edgings, and 120 seers of seed will suffice for 150 feet in length of the above sized beds; sow from 10th to 15th April. Before sowing steep the seed forty-eight hours in water, then sow and cover with a thin covering of fine soil nearly ¾ inch, then cover with straw to retain the moisture, placing betwixt the soil and straw a few very small twigs without leaves to prevent the straw from being washed into the earth by water; if this be allowed, the young seedlings are apt to be destroyed on removing the straw. Water daily copiously, say, a common earthen-pot of water to each two running feet in length of bed less or more according to free soil, or otherwise: in this way the seed will germinate in from 10 to 15 or 20 days or more according to freeness of soil; water less as the plant strengthens, but keep up sufficient moisture till the monsoon sets in from the first to the third week in June. The plants will then be from 4 to 8 inches high and ready for planting out permanently.

Site. 248

"SITE.—The site for planting should be selected and felled in December, allowed to dry till March, fired, then cross cut, piled, and burned off. After the soil is softened by the rains, line and mark off the pits the required distance apart; from 6 to 7 feet answers well, the pits dug from 10 to 12 inches square and equal depth and filled in as dug with earth slightly raised around tops.

Planting. 249

"PLANTING.—The seedling should be put well down in the pit, taking care the tap-root is not twisted and turned up (to prevent which the tap-root is shortened to 6 inches as lifted from the bed). When planting the cooly inserts his hand the required depth perpendicularly, taking out the soil and putting the seedlings with the other hand (as above, without twisting or turning up the root), putting back the removed soil and pressing it firmly round, without damaging the plant, and this prevents its being wind-waved before taking root.

"Planting should take place after the soil is well saturated with rain; from the 10th to 30th June and 8th July is the best season, since, if later, the seedling's tap-root rapidly swells like a carrot and does not throw out fibrous roots, nor establishes itself either so quickly or so well as before that state of growth. When the planting cannot be finished by the 8th of July, the small vigorous seedlings which continue to germinate up till August and will even germinate after twelve and fourteen months in the beds, should be selected in preference to larger, more robust ones, with carroty roots."

Felling. 250

FELLING.—As teak is, for the most part, removed from its native forest by water carriage, and since it does not float till thoroughly seasoned, a peculiar mode of seasoning is practised in many teak-growing regions. This practice, known as "girdling," consists in making a deep circular cut through the bark and sapwood so as to completely sever the communication in these layers above and below the incision. A tree thus treated dies after a few days if the operation has been effectual, but, if even the smallest band of sapwood remains to keep up communication, it frequently recovers completely. The girdled tree is allowed to stand one or two years, often longer, if large, and being fully exposed to the wind, rain, and sun, seasons more rapidly and more completely than a tree that has been felled green. Girdling has long been practiced in Burma and Travancore, but was also formerly common further north on the west coast. It is not

AREA under TEAK CULTIVATION

Felling.

now practised in the Anamally, Wynaad, Mysore, and Canara forests, whence most of the "Malabar" teak is obtained, a circumstance that may account for the greater weight of West Coast when compared with Burma timber.

Opinions differ considerably as to the effect of this practice on the quality of the timber. Brandis, from whom the above description of the

Timber Inspector to the Admiralty, is given as follows in his work on *Timber and Timber Trees*:—"The practice of girdling is, I think, objectionable, inasmuch as the timber dries too rapidly, is liable to become

Growth. 251

may be accepted as a fairly accurate average estimate of the girth at 6 feet from the ground for trees in natural forests in Burma and South India:—at 19 years, 18 inches; at 46, 36 inches; at 88, 54 inches; at 160 years, 72 inches.

DISEASES, 252

DISEASES.

boring insects, and thus permanently injured. Mr. Laslett also comments on the frequency of "heart-shake," especially in logs taken from old trees. This defect is often found to extend to one-half, sometimes to two-thirds, the diameter of the tree, and may stretch along the whole length of it. If in one plane throughout the conversion of the log involves no greater difficulty or loss than that occasioned by dropping out a piece large enough to include it. When, however, the cleft at the top is at right angles or nearly so to that at the base it obviously occasions a serious defect.

RESIN. Tar. 253

Resin.—A rather liquid, black TAR may be prepared by destructive distillation of the wood, in the same way as that made from the various species of Pinus (*see* Pt. I., 213). It is made in small quantities in South India and Burma for medicinal purposes, but is neither prepared nor sold in large quantities. Mr. Sterndale, of Seoni, writing in 1860, describes the manufacture as follows:—"In the first place the wood,—that which has been cut about three months is the best—if too fresh the tar is thinner; about 20 seers of the cut wood will yield one seer of tar, to extract which from one to two maunds of cowdung fuel (which is always used) is required; this costs about two annas a maund. Allowing the full quantity of fuel, which would be four annas, and, say, one anna for the wood (which is over the price), and two annas daily hire to a man to attend the distilling, the maximum cost of one seer of tar is seven annas. If a larger quantity is made, of course it would be cheaper, as one man could attend to several distilleries. I should say 4 annas per seer is a fair average. Yesterday I measured off a cubic foot of good teak and had it distilled, the product was about one seer of tar, the fuel, one and a half maund of dried cowdung" (*Jour. Agri.-Horti. Soc. Ind.*, (*Old Series*) *XI., Pro. lxv.*). The prices above given would now probably be increased owing to the enhanced value of labour. Teak tar was examined in the same year by Mr. G. Evans, who reported that it contained all the ingredients found in coal tar, but in different relative proportions. "I am of opinion," he added, "that if used in every way in which coal-tar is made available, its effects would be much less permanent, particularly if exposed to the action of the atmosphere, but this could only be proved by actual experiment, and by noticing its effects for a length of time. I am convinced that it might be rendered much more valuable by concentration, say, by exposure to the sun's rays for a short time in large evaporating pans, as it would then part with a large amount of watery vapour, which it contains in a free state" (*Jour. Agri.-Horti. Soc. Ind., XI., Pro., xlviii.*).

More recently teak wood has been examined by Dymock, who states that it yields on distillation an opalescent distillate impregnated with resinous matter, but no trace of essential oil could be obtained when operating with 126lb of fresh sawdust. One pound of the sawdust exhausted with alcohol yielded a resinous extract, which, after having been well washed with hot water, weighed half an ounce; the resin was black and had the characteristic odour of the wood.

DYE. Leaves. 254

Dye.—The LEAVES are said to yield a red or yellow dye, of which very little is known. Kurz writes: "The leaves have been used and strongly recommended for dyeing silk yellow, olive, &c.," but he does not state whether they are so employed in Burma, the country to which most of his observations relate. Drury mentions that they yield a purple (?) colour, employed as a dye for silk and cotton. Darrah (*Note on Cotton in Assam*) does not describe them as in themselves tinctorial, but mentions that they are employed as a mordant with *thoiding*, a species of LABIATÆ, in dyeing black. [The Natives of many parts of India have a peculiar method of recognising the teak leaf. They scratch the surface, moisten the part with saliva, and rub, when if it be teak a red colour is produced.

This phenomenon may be connected with the tinctorial property of the plant. *Ed., Dict. Econ. Prod.*]

OIL. Wood. 255 Seeds. 256

MEDICINE. Wood. 257

Bark. 258 Nuts. 259

Fruit. 260 Tar. 261 TIMBER. 262

TECTONA grandis.

Trade in Teak.

TIMBER.

[illegible]lb. but that after being well dried and sawn into scantlings the weight fell to [illegible] or [illegible]lb. Gamble remarks that Captain Dundas' value for P. is an unreliable one, for it was based on experiments made with beams of the large size of [illegible] feet x [illegible] in. After many experiments on timber from all the teak-growing localities of India Brandis remarks: "The comparative value of rapidly and slowly grown teak has not yet been determined in a satisfactory manner. It is well known that the rapidly-grown oak produced on alluvial soil in South and Central Europe is, for many purposes, considered equal, if not superior, in value to the slow-grown timber of Northern France and Germany or of England. It seems, however, to be a fact established by experience at the Bombay dockyard, that the fast-growing saplings of the Malabar plantations are less valuable for oars than the slow-grown poles produced in the coppice woods of Severndrûg and Colaba."

The many uses of Teak are well known. In India it is highly prized for construction, ship-building, bridge-making, and for making sleepers and furniture. In Europe it is chiefly employed for building railway carriages, for ship-building, for making decks and lower masts, and for the backing of armour plates in ironclads. It is peculiarly useful for the latter purpose, owing to the fact that the tarry matter which it contains acts as a preventive against rust, consequently the wood neither affects the iron injuriously nor is affected by it. It is far superior to oak in this respect.

TRADE. 263

Trade.—The trade in Teak is very large and important, and notwithstanding competition of other materials in ship-building, shews no signs of diminution. No statistics are available of internal trade by road, rail, and river, but the figures given by Mr. O'Conor in his *Statement of the Coasting Trade* shew the distribution of teak to various parts of India from Burma. Most of the timber shown in these tables, as well as that which goes to make up the large Foreign Trade, is floated down the Irrawaddy and Salween to Rangoon and Moulmein from the vast forests of Burma. Thence it is shipped to other Indian ports or to foreign countries. The transactions by coasting vessels are very large. Thus, during the five years ending 1889-90, the registered imports averaged annually [illegible] cubic tons, valued at R[illegible], while the exports averaged [illegible] cubic tons valued at R[illegible]. In the past year (1889-90) the imports amounted to [illegible] cubic tons, valued at R[illegible]. Of this amount [illegible] cubic tons were exported from Burma to other Presidencies; while Madras exported [illegible] cubic tons and Bombay [illegible] cubic tons. The largest importer was Bombay with [illegible] cubic tons, followed by Bengal with [illegible], Madras with [illegible], and Sind with [illegible]. The Bombay and Madras supplies came chiefly direct from Burma, while a great portion of those of Sind were shipped from ports in the Bombay Presidency. From this short analysis it will be seen that a large demand exists in India, a demand almost entirely supplied from Burma.

EXPORTS. 264

The foreign exports have remained, on an average, fairly steady during the past twenty years, though fluctuations in the European ship-building industry have naturally influenced the trade considerably from year to year. The averages of the four quinquennial periods may be shewn in the following table:—

Quinquennial period.	Cubic tons.	R
1870-71 to 1874-75	[illegible]	[illegible]
1875-76 to 1879-80	[illegible]	[illegible]
1880-81 to 1884-85	[illegible]	[illegible]
1885-86 to 1889-90	[illegible]	[illegible]

Trade in Teak. (*J. Murray.*)

TECTONA grandis.

TRADE. Exports.

... export on record during these twenty years was in 1886-87

Analysis of Exports during 1889-90.

Countries to which exported.	Cubic tons.	R	Share of each Presidency or Province. Presidency or Province.	Cubic tons.	R
United Kingdom	60,213	64,78,888	Bengal	792	74,734
Austria	8	1,300			
Belgium	50	6,025	Bombay	1,373	1,42,490
France	36	4,393			
Germany	349	37,171	Sind	...	8
Italy	1,244	1,34,978			
Malta	15	1,825	Madras	1,144	74,729
Spain	663	1,28,707			
Cape Colony	156	15,780	Burma	68,033	73,38,020
East Coast of Africa { Zanzibar	355	40,156			
East Coast of Africa { Other Ports	3	300			
Egypt	3,400	3,99,788			
Mauritius	1,292	1,09,723			
Natal	31	2,835			
Aden	221	24,778			
Arabia	845	55,281			
Ceylon	1,935	1,41,295			
Persia	39	4,157			
Straits Settlements	194	24,906			
Turkey in Asia	199	12,329			
Australia	40	4,340			
Other Countries	14	1,025			
TOTAL	71,342	76,29,981	TOTAL	71,342	76,29,981

... the United Kingdom,

trade has sprung up
1879-80 this averaged

imported into Bo
tons during the
from Bombay.
mills—*Ed.*]

Prices and Freight.—During 1889-90 the market rate of Moulmein teak in Bombay varied from R65—R95 for squares in April 1889, to R65—R80

PRICES. 265

TEPHROSIA purpurea. A Domestic Medicine.

PRICES. in March 1890, while in Calcutta squares sold fairly regularly during the year between the prices of R70 and R90. Scantlings fell in price in Bombay from R90 to R95 in April 1889, to R85 to R90 in May, at which rate they continued during the year. In Calcutta they sold at from R85 to R95 from April to June, from R90 to R95 from June to October, and at R95 to R100 from October to March 1890. The home prices for Rangoon timber varied between £11 and £16 according to quality; for Moulmein teak from £11 to £12-10 in April 1889, to £9—£11 in February 1890. The freight per ton from the latter port varied from 47*s.* 6*d.* to 52*s.*-6*d.*

Freight. 266

DOMESTIC. Leaves. 267 Domestic and Sacred.—The LEAVES are used as plates all over teak-growing districts, and are also employed for packing and thatching. The timber frequently has a whitish mineral concretion in its cracks and crevices, which has been found to contain a large proportion of calcic carbonate. It is frequently used as a substitute for lime by the Natives of Southern India for eating with *pân*. For a full account of its chemical composition the reader is referred to Mr. D. Hooper's note on the subject (*Nilghiri Nat. Hist. Soc., Ootacamund*).

268 **Tectona Hamiltoniana**, *Wall.; Fl. Br. Ind., IV., 571.*

Syn.—THEKA TERNIFOLIA, *Ham.*

Vern.—*Ta-hat, ta-nap*, BURM.

References.—*Kurz, For. Fl. Burm., II., 259; Gamble, Man. Timb. 293; Mason, Burma & Its People, 526.*

Habitat.—A small, deciduous tree, met with in the Prome district and Upper Burma.

TIMBER. 269 Structure of the Wood.—Light brown, hard, close-grained; weight about 64lb per cubic foot; a good wood, and likely to be useful (*Gamble*).

Telini Fly, see Mylabris cichorii, *Fabr.;* COLEOPTERA; Vol V., 309.

TEPHROSIA, *Pers.; Gen. Pl., I., 496.*

270 **Tephrosia purpurea**, *Pers.; Fl. Br. Ind., II., 112*; LEGUMINOSÆ.

Syn.—GALEGA PURPUREA, *Linn.*; G. LANCEÆFOLIA, *Roxb.*; G. COLONILA and SERICEA, *Ham.*; G. TINCTORIA, *Lamk.*; TEPHROSIA STRICTA, TAALORII, WALLICHII, LOBATA, TINCTORIA, GALEGOIDES, and LANCEOLATY, *Grah.*; INDIGOFERA FLEXUOSA, *Grah.*

Var. maxima,=T. MAXIMA, *Pers.*; GALEGA MAXIMA, *Linn.*; T. MITCHELLII, *Grah.*

Var. pumila,=T. PUMILA, *Pers.*; T. TIMORIENSIS, *DC.*; T. DIFFUSA, *W. & A.*; GALEGA DIFFUSA, *Roxb.*; G. PROCUMBENS, *Ham.*; T. PARVIFLORA, *Wight.*

Vern.—*Sarphónká*, HIND.; *Sarphónká, ban-nil gáchh*, BENG.; *Bánsabánsu, jhojhrú, sarphonka, sarpankh*, PB.; *Surpunka*, SIND; *Sarphúnkha, jangli kulthi, unhali*, BOMB.; *Sharapunkha*, MAR.; *Jhila*, GUZ.; *Hunnáli, jangli-kulthí*, DEC.; *Kolluk-káy-vélai*, TAM.; *Nempali, bonta vempali, tella vempali, mulu vempali, nela vempali, yampali, tella yampali*, TEL.; *Kozhinnila*, MALAY.; *Sarapunkhá*, SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 587, 588; Voigt, Hort. Sub-Cal., 215; Thwaites, En. Ceyl. Pl., 84; Dalz. & Gibs., Bomb. Fl., 61; Stewart, Pb. Pl., 76; Mason, Burma & Its People, 479, 766; Sir W. Elliot, Fl. Andhr., 30, 180, 191; Rheede, Hort. Mal., I., t. 55; Ainslie, Mat. Ind., II., 49, 157; O'Shaughnessy, Beng. Dispens., 292; Irvine. Mat. Med. Patna, 120; Moodeen Sheriff, Supp. Pharm. Ind., 240; U. C. Dutt, Mat. Med. Hind., 317; Murray, Pl. & Drugs, Sind, 117; Dymock, Mat. Med. W. Ind., 2nd Ed., 217; Dymock, Warden & Hooper, Pharmacog. Ind., I., 415; Cat. Prod., Baroda Durbar, Col. & Ind. Exhib., No. 171; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 308, 751; Nicholson, Man. Coimbatore, 39, 192; Gribble, Man. Cuddapah Dist., 40, 227; Boswell, Man. Nellore, 128, 131, 139, 143; Gazetteers:—Panjáb, Gujrát, 12; Gurgáon, 17; N.-W. P., I., 80; IV., lxx.; Mysore, & Coorg, I., 59; Ind. Forester, IV., 233; VI., 240; XII., App. 2, 11.*

Hab... [illegible]

MEDICINE. Root. 271

Plant. 272

sale. It appears to act as a tonic and laxative.

In certain localities of the Panjáb, an infusion of the SEEDS is believed to be "cooling" (*Stewart; Dymock*). Seeds. 273

C... [illegible]

Tephrosia tenuis, *Wall.; Fl. Br. Ind., II., 111.* 276

Syn.—MACRONYX STRIGOSUS, *Dalz.*

References.— [illegible] *117;*

Habitat —

Domestic.- DOMESTIC. Twigs. 277

(*Murray*).

T. tinctoria, *Pers.; Fl. Br. Ind., II., 111; Wight, Ic., t. 388.* 278

Syn.—T. HEYNEANA, *Wall.*; T. HYPARGYRÆA, *DC.*; T. NERVOSA, *Pers.*, GALEGA HEYNEANA, *Roxb.*

Vern.—*Anil, alú-pilla,* SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 587, Thwaites, En. Cey. Pl., 84; Gazetteers:—Mysore & Coorg, I., 56; Bombay, Kanara, XV., 431.*

Habitat.—An undershrub, met with in the Western Peninsula and Ceylon, ascending to 5,000 feet.

Dye.—A blue dye, similar to Indigo, is sometimes extracted from this PLANT in Mysore. (*Conf.* with Indigofera tinctoria, *Linn.*; Vol. IV., 410, 412, 451.) DYE. Plant. 279

T. villosa, *Pers.; Fl. Br. Ind., II., 113.* 280

Syn.—T. ARGENTEA, *Pers.*; GALEGA VILLOSA, *Linn.* G. ARGENTEA, *Lamk.*; G. BARBA-JOVIS, *Burm.*

Vern.—*Vaykkavalai,* TAM.; *Bú-pilla,* SING.

References.—*Roxb., Fl. Ind., 587; Burm., Fl. Ind., 172; Thwaites, En. Cey. Pl., 84; Dymock, Warden, & Hooper, Pharmacog. Ind., I., 416; Gazetteer, N.-W. P., I., 80.*

Habitat.—A much-branched perennial, native of the plains from the Himálaya to Ceylon.

MEDICINE. Leaves. 281 **Medicine.**—" In Pudukota, the juice of the LEAVES is given in dropsy (*Pharmacog. Ind.*).

TERMINALIA, *Linn.; Gen. Pl., I., 685.*

282 **Terminalia Arjuna,** *Bedd.; Fl. Br. Ind., II., 447*; COMBRETACEÆ.

Syn.—T. BERRYI, *W. & A*; T. GLABRA, *W. & A.*; T. OVALIFOLIA, *Rottl.*; PENTAPTERA ARJUNA, P. GLABRA, & P. ANGUSTIFOLIA, *Roxb.*

Var. angustifolia,=PENTAPTERA ANGUSTIFOLIA, *Roxb.*; TERMINALIA ANGUSTIFOLIA, *Roxb.*, is an obscure form, apparently allied to T. CHEBUL, but distinct form P. ANGUSTIFOLIA, *Roxb.*

Vern.—*Arjan, kahú, árjún, khawa, ánjan, árjúna, ánjani, jamla, koha, kowa, kahúa,* HIND.; *Arjún, kahu, árjúna,* BENG.; *Gara hatana,* KOL; *Kanha,* SANTAL; *Orjun,* ASSAM; *Arjun, hanjal,* URIYA; *Arjun,* MELGHAT; *Kowah, kow, kahua, saj, kowha,* C. P.; *Kahu,* BAIGAS; *Mangi, koha,* GOND; *Kowa,* BANDA; *Anjani, arjan,* N.-W. P.; *Arjan, jumla,* PB.; *Arjún, arjun, anjan, jamla, kowa, arjuna-sadra,* BOMB.; *Sán madat, arjun, anjan, sadura, arjuna, arjun ladada, asun,* MAR.; *Sádado, arjun sádada,* GUZ.; *Vellai-maruda, vella marda, vella matti, veila marúthú,* TAM.; *Tandra,* CUDDAPAH; *Tella-maddi, tella madu, maddi, erra maddi, yer muddi,* TEL.; *Maddi, tormatti, holematti, billi matti,* KAN.; *Vella-maruta, pulla-maruta,* MALAY.; *Toukkyan,* BURM.; *Kumbuk,* SING.; *Kukubha, árjuna,* SANS.

References.—*DC., Prodr., III., 14; Roxb., Fl. Ind., Ed. C.B.C., 382, 383; Voigt, Hort. Sub. Cal., 37; Brandis, For. Fl., 224; Kurz, For. Fl. Burm., I., 458; Beddome, Fl. Sylv., t. 28; Gamble, Man. Timb., 184; Thwaites, En. Cey. Pl., 104; Trimen, Sys. Cat. Cey. Pl., 32; Dalz. & Gibs., Bomb; Fl., 91 92; Stewart, Pb. Pl., 88; Aitchison, Cat. Pb. & Sind. Pl., 59; Rev. A. Campbell, Rept. Econ. Pl., Chutia Nagpur, No. ?546, 9463; Grah., Cat. Bomb. Pl., 69; Mason, Burma & Its People, 533, 743; Sir W. Elliot, Fl. Andhr., 52; Sir W. Jones, Treats. Pl. Ind., 147; Ainslie, Mat. Ind., II., 193 (under name of T. alata, Kœn.); Moodeen Sheriff, Supp. Pharm. Ind., 243; U. C. Dutt, Mat. Med. Hind., 163, 291, 306; Sakharam Arjun, Cat. Bomb. Drugs, 209; Dymock, Mat. Med. W. Ind., 2nd Ed., 323; Birdwood, Bomb. Prod., 330; Baden Powell, Pb Pr. 350, 399; Drury, U. Pl. Ind., 336; Atkinson, Him. Dist. (X. N.-W. P. Gaz.), 301; Useful Pl. Bomb. (XXV., Bomb. Gaz.), 74 Forbes Watson, Ind., Survey, 196, 277; Econ. Prod. N.-W. Prov., Pt. I (Gums and Resins), 16; Liotard, Dyes, 71, 90, App. VI.; Wardle, Rpt. Dyes 15; Cooke, Gums & Resins, 26; McCann, Dyes & Tans, Beng., 128, 133, 151, 161, 165, 166; Watt, Selections Records Govt. India (R. & A. Dept.) 1888-89, pp. 87-88; Man. Madras Adm., 313; Boswell, Man., Nellore, 98, 127; Gribble, Man. Cuddapah, 263; For Admin. Rep. Chota Nagpore, 1885, 6, 31; Settlement Reports:—Central Provinces, Nimar, 305; Beláspur, 77; Raepur, 75; Chhindwára, 110; Baitool, 125, 135; Seonee, 10; Upper Godávery, 37; Bhundara, 18, 19, 20; Gazetteers:—Bombay, V., 285; VI., 12; VII., 32, 37; XV., Pt. I., 77, Pt. II., 33; N.-W. P., I., 81, IV., lxxi.; Orissa, II., 158., App. IV.; Agri.-Horti. Soc. Ind.:—Trans., VII., 57; Jour. IX., Sel. 44; New Series, VII., 139, 140, 276; Ind Forester, IV., 227, 322; VI., 240, 303, 338; VIII., 29, 116; X., 31; XI., 231; XII., App., 13; XIII., 121; XIV., 288; Balfour, Cyclop. Ind., III., 849 etc. etc.*

Habitat.—A large, deciduous tree, common throughout the Sub-Himálayan tracts of the North-West Provinces, the Deccan, Southern Behar, Chutia Nagpur, Burma, and Ceylon.

GUM. 283 **Gum.**—A clear, golden-brown, transparent gum, obtained from the tree, is met with in the bazárs of Northern India, as a drug (*Baden Powell*). A small sample was sent (from Madras?) by Dr. Shortt to the London Exhibition of 1862 (*Cooke*). Nothing is recorded in Indian economic literature as to its properties or uses, with the exception of Rev. A. Campbell's remark that it is edible (*Ec. Prod. Chutia Nagpur*).

DYE & TAN. Bark. 284 **Dye and Tan.**—The astringent BARK in various localities is said to be sometimes used in dyeing. In Southern India the inner bark is broken into

DYE & TAN

chips and the dye extracted by boiling in water. The tint produced is a dirty brown or *khaki* colour (*Liotard*). In Midnapur (Bengal) it is used to dye cotton a light brown, the method employed being as follows:—for dyeing a yard of cloth a pound of the bark is cut or broken into very small chips, and is boiled in about 5lb of water until about 1lb of water remain. The solution is then allowed to cool. A *pice* weight of alum (about ¼ oz.) is then pounded and mixed with the solution. The cloth to be dyed is washed in pure water, and the moisture well wrung out of it. It is then steeped in the above solution, and afterwards put to dry in the shade; this steeping and drying is repeated two or three times. In Midnapur also it is employed in preparing a black dye, along with the barks of *garan* (Ceriops Roxburghiana) and *babla* (Acacia arabica). The price of the bark is given in Bengal as 3 annas per seer (*McCann*). Samples examined by Mr. T. Wardle were found to contain a fair amount of colouring matter readily soluble in boiling water. An infusion gave in ... colours ranging from light

[illegible] ...lk and cotton

[illegible] ...ances as an ad- Ashes. 285

[illegible] ...da citrifolia) and

[illegible] ...bark contains a

[illegible] ...g to Wardle), it

[illegible] ...r it is generally

[illegible] ...of Acacia arabica.

[illegible] ...d, it contains nearly

[illegible] ...tab tion examined

[illegible] ...et. of gallo-tannic

and (*Watt*).

Wax.—The TWIGS and BRANCHES of this species are frequently found covered with vegetable wax (*Conf.* Oils, Vol. V., 459). WAX. Twigs. 286 Branches. 287

Medicine.—The BARK is considered by Sanskrit writers to be tonic, ... fractures, MEDICINE. Bark. 288

[illegible]

sive echymosis, the powdered bark is given with milk. A decoction is employed as a wash for ulcers and chancres (*U. C. Dutt*). Ainslie, describing what, from the vernacular names, is evidently this species, states that the bark is considered by the *Vytians* to be febrifuge, and, when powdered and mixed with *gingili* oil, to be a valuable application for aphthæ. The juice of the LEAVES, he adds, is poured into the ears to allay the pain of earache. Baden Powell informs us that in Northern India the bark is considered "hot" and astringent, useful in bilious affections, and as an antidote to poisons. The FRUIT is prescribed as a tonic and deobstruent. Leaves. 289 Fruit. 290

Structure of the Wood.—Sapwood reddish white; heartwood brown; variegated with darker coloured streaks, very hard; weight 48 and 54lb per cubic foot (*Skinner*), 47lb (*Cent. Prov. List.*), 57lb (*Gamble*). It is apt to split in seasoning and is not easy to work. It is chiefly used for making wheels of country carts, for house-building, and for making agricultural implements, boats, and canoes. It appears to be generally regarded as an inferior timber, since it does not stand variations of temperature and moisture, and is subject to the attacks of white ants. TIMBER. 291

Domestic.—Campbell states that the *tasar* silk-worm is often found on the tree in Chutia Nagpur. (*See* Silk, *Vol. VI., Pt. III.*) DOMESTIC 292

293 **Terminalia belerica**, *Roxb.*; *Fl. Br. Ind., II., 445.*

BELLERIC MYROBALAN.

Var. 1. typica.—T. BELERICA, *Bedd., Fl. Sylv., t. 19*; T. ERIOSTACHYA, *Roxb.*; T. MOLUCCANA, *Roxb.*; T. BELERICA, *W. & A. Prodr.* (*Excl. syn.*); T. GELLA, *Dalz.*; T. PUNCTATA, *Roth*; MYROBALANUS BELERICA, *Gaertn.*

Var. 2, belerica, *Roxb.*—? T. MICROCARPA, *Dcne.*

Var. 3, laurinoides, *Miq.*

Vern.—*Bhaira, bahera, bahera, behra, bhairah, sagona, bharla, bulla, bahura*, HIND.; *Bohera, bahera, baheri, bhairah, bahira, bohora, bohura, bahara, bohuri, bayra*, BENG.; *Lupung, lunung*, KOL.; *Lopong*, SANTAL; *Hulluch, bauri*, ASSAM; *Canura*, GARO; *Kanom*, LEPCHA; *Thara, bhara, bhairi, bahada*, URIYA; *Sadang*, MAGH.; *Yehera*, BHIL; *Bahera, bhera, bhaira, baheri, behera, beruli*, C. P.; *Tohaka, yeha-bariji*, GOND.; *Bahira, bahira, bahura*, N.-W. P.; *Bahira, balera, birha, balla, bayrah, bahira*, PB.; *Bahera*, MERWARA; *Hira, jhira*, HYDERABAD; *Bayrah*, SIND; *Behera, bahda, bahri, baira, bairda, bhilla, bharda, yehala*, DEC.; *Behara, behada, behala, beheda, bharda, behada, baira, ghaira, bharda, bahadda, yela, hela, goting, yel*, BOMB.; *Bharda, behada, behera, yela, goting, beherda, behedi, sagwan, bahil, hela, berda, yehela beheda*, MAR.; *Bahedam, beheda, behedi, sag*, GUZ.; *Tani, thani, tandi-kadukay, tanri-kay, tandi tonda, thanu-kaya, tanikai, tani-kai, tani-kaia, kattu-elupa, valai-maradu, tanikai, kattu-elupa*, TAM.; *Tani, tandi, bhandi, thandra, thare, tadi, thani, tondi, kattu-elupa, tandra-kaya, thandri, thandi, bahadrum, bahadra*, TEL.; *Santi, tare, tarekayi, tare-kayi, bharda, yehela, tari*, KAN.; *Thani, tani*, MALAY.; *Thitsein, thitsein, tsan-ben, phanhkha-si, phangi-si, phangah, pangan, yahira*, BURM.; *Bulu, bulu-gaha*, SING.; *Vibhitaka, vibhitaka, vibhitaki, bibhitaka, aksha, tusha, kalidruma, bahuvirya, bahira*, SANS.; *Balilaj, balilaj, balilaj*, ARAB.; *Balila, belaylah, balilah*, PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 380*; *Voigt, Hort. Sub. Cal., 36*; *Brandis, For. Fl., 222*; *Kurz, For. Fl. Burm., II., 455*; *Pegu Rept., app. A., lix., B., 49*; *Beddome, Fl. Sylv., t. 19*; *Gamble, Man. Timb., 173*; *Cat., Trees, Shrubs, &c., Darjeeling, 39*; *Thwaites, En. Ceyl. Pl., 103*; *Trimen, Sys. Cat. Cey. Pl., 32*; *Dals. & Gibs., Bomb. Fl., 91*; *Stewart, Pb. Pl., 89*; *Aitchison, Cat. Pb. & Sind Pl., 59*; *Rev. A. Campbell, Rept. Econ. Pl., Chutia Nagpur, No. 7526*; *Graham, Cat. Bomb. Pl., 69*; *Mason, Burma & Its People, 451, 743*; *Sir W. Elliot, Fl. Andhr., 172*; *Rheede, Hort. Mal., IV., t. 10*; *U. S. Dispens., 15th Ed., 1725*; *Fleming, Med. Pl. & Drugs (Asiatic Reser., XI.), 181*; *Ainslie, Mat. Ind., I., 236*; *O'Shaughnessy, Beng. Dispens., 321*; *Irvine, Mat. Med. Patna, 17*; *Med. Topog. Ajmere, 128*; *Moodeen Sheriff, Supp. Pharm. Ind., 241*; *U. C. Dutt, Mat. Med. Hind., 163, 322*; *S. Arjun, Cat. Bomb. Drugs, 51*; *K. L. De, Indig. Drugs Ind., 117*; *Murray, Pl. & Drugs, Sind, 186*; *Cat. Baroda Durbar, C. & I. Exhibn., No. 172*; *Bidie, Cat. Raw Pr., Paris Exhib., 29, 62, 112*; *Dymock, Mat. Med. W. Ind., 2nd Ed., 320*; *Dymock, Warden & Hooper, Pharmacog. Ind., I., 554*; *II., 5*; *Official Corresp. on Proposed New Pharm. Ind., 238*; *Year Book Pharm., 1873, 213*; *Trans., Med. & Phys. Soc. Bomb. (New Series), No. 2, 152*; *Birdwood, Bomb. Prod., 33, 153, 256*; *Baden Powell, Pb. Pr., 350, 453, 599*; *Drury, U. Pl. Ind., 417*; *Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 310, 777*; *Useful Pl. Bomb. (XXV., Bomb. Gaz.), 75, 155, 215, 244, 376*; *Forbes Watson, Ind. Survey, 58, 101, 111, 125, 172, 277*; *Econ. Prod. N.-W. P., Pt. I. (Gums & Resins), 7*; *Pt. III. (Dyes and Tans), 85*; *Pt. V. (Vegetables, Spices & Fruits), 73*; *Gums & Resinous Prod. (P. W. Dept. Rept.), 2, 14, 22, 26*; *Liotard, Dyes, 15-16, 21, 22, 132*; *Cooke, Oils & Oilseeds, 77*; *Gums and Resins, 26*; *McCann, Dyes & Tans, Beng., 38, 144, 146, 150-151, 161, 155*; *Darrah, Note on Cotton in Assam, 33*; *Christy, New Com. Pl., V., 40, 44*; *Ayeen Akbary, Gladwin's Trans., II., 124*; *Statistics Dinajpur, 150*; *Man. Madras Adm., I., 313*; *Nicholson, Man., Coimbatore, 42*; *Boswell, Man., Nellore, 110, 137*; *Gribble, Man. Cuddapah, 12*; *Butler, Top. Oudh & Sultanpur, 33*; *Settlement Reports:—Panjab, Kangra, 22*; *N.-W. P., Shahjahanpore, IX.*; *C. P., Chanda, app. VI.*; *Upper Godavery, 38*; *Seonee, 10*; *Bhandara, 19*; *Raipore, 75*; *Mundlah, 88*; *Chindwara, 110, 111*;

GUM Bark, 294

swells up and forms a bulky gelatinous mass; its taste is insipid. Roxburgh's statement that it is perfectly soluble in water, and Drury's, that it burns like a candle, I am unable to confirm." The authors of the

DYE & TAN Fruit 295

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h. Wash
water, in
the cloth

TERMINALIA belerica. The Belleric Myrobalan.

DYE & TAN. in the dye solution, working it about well so as to make the colour uniform. When the colour is deep enough, dry the cloth in the sun, and afterwards wash frequently in clear water, so as to get rid of the smell of the dye. The resulting colour is a snuffy yellow" (*McCann*). The drupe is also used as a mordant, instead of *harra* (T. Chebula), in dyeing with madder or *manjit*. In many localities it is employed as a tan in the same way as *harra*, and McCann states that the LEAVES are similarly used in Birbhum. Buchanan mentions the BARK as also employed in tanning, but it would appear to be less astringent, and consequently much less valued than those of other species.

Leaves. 296

The fruit ripens during the cold season, from November to January, and in Bengal costs about the same as inferior *harra, viz.*, from R1 in Mánbhum to about R5 in Chittagong (*McCann*). Sir E. C. Buck, in his *Account of the Dyes and Tans of the North-West Provinces*, gives the export from Najibabad in 1874-75 as 36½ cwt., value R50, from Garhwál as 135¾ cwt., value R219. It is, however, impossible to separate the trade accounts of this, from those of the other kinds of myrobalan (see T. Chebula).

Chemistry 297

CHEMICAL COMPOSITION.—Analyses of the fruit of this, as of other myrobalans, give very varying results and strongly indicate the necessity of a thorough investigation into the effects of climate, soil and age of the fruit on its tanning value. Samples were submitted by Dr. Watt, from the Colonial and Indian Exhibition, to Dr. Paul and Professor Hummel for examination. Two samples, examined by the former chemist were found to contain only 5·03 and 6·70 per cent., respectively, of gallo-tannic acid, while that analysed by the latter contained 17·4 per cent. Professor Hummel remarks, "The fruit consists of two distinct portions, an outer and an inner; 100 parts contain 75·4 parts of outer, and 24·6 parts inner. The inner portion only contains 1·25 per cent. of tannic acid." "This remarkable difference is worthy of note" Professor Hummel estimated the value of the fruit at 5*s.* 8*d* per cwt. compared with commercial ground myrobalans at 7*s.* 6*d.* per cwt. (*Watt, Selections from the Records of the Govt. of Ind., I., 88, 93*). The authors of the *Pharmacographia Indica* have recently examined the pulp of the smaller kind of belleric myrobalan and the kernel separately with the following result:—

	Pulp.	Kernel.		Pulp.	Kernel.
Moisture . . .	8·00	11·38	Ether extract .	·41	·61
Ash	4·28	4·38	Alcoholic ,, . . .	6·42	·61
Petroleum ether extract	·12	29·82	Aqueous ,, . .	38·56	25·26

The extracts obtained from the pulp were found to be as follow:—The petroleum ether extract contained a greenish yellow oil. The ethereal extract contained colouring matter, resins, a trace of gallic acid and oil, but no alkaloid. The alcoholic extract was yellow, brittle, highly astringent, and partly soluble in warm water. The aqueous extract gave various tannin reactions. Of the kernels, the petroleum ether extract consisted of a pale yellow, thin, nutty-flavoured oil, non-drying and insoluble in alcohol; the ethereal extract was also oily (see paragraph Oil); the alcoholic extract was partly soluble in hot water, with acid reaction and tasteless, the aqueous extract contained no sugar nor saponin. No alkaloid was detected.

OIL. Seeds. 298

Oil.—The SEEDS yield a fatty oil to the extent of about 30·44 per cent. which on standing separates into two portions, the one fluid, of a pale green colour, and the other flocculent, white, semi-solid, with the consistence of *ghí*. It is used medicinally.

starving cat, with, in both cases, negative results. These authors therefore regard their experiments as fairly conclusive that the kernels do not possess any toxic properties.

FOOD.

Leaves. 303 Stewart states that in Kangra the LEAVES are considered the best fodder for milch cows.

TIMBER. 304 **Structure of the Wood.**—Yellowish-grey, hard, no heartwood; similar in structure to that of **Ougeinia dalbergioides**; weight 43lb per cubic foot (*Brandis, 1874, from Assam experiments*), 30lb (*Cent. Prov. Lists*), 40lb (*Burma Lists*), 45lb (*Gamble*). It is not durable, is readily attacked by insects, and is consequently of little value. It is, however, employed for planking, for making packing cases and canoes, and in the North-West Provinces, for house-building after being steeped in water, which is said to have the effect of making it more durable. In the Central Provinces it is used for plough-shafts and carts when *bijasal* is not available. In South India it is employed for making packing cases, coffee boxes, catamarans, and grain measures.

DOMESTIC Tree 305 **Domestic and Sacred.**—The TREE is an excellent one for avenue purposes, but has many superstitions connected with it which interfere with its utility. Thus the Hindus of Northern India consider it to be inhabited by demons, and consequently avoid it, never sitting under its shade. In Central and Southern India the people will not use the timber for building, under the impression that a dwelling-house which contains it is fated, and that no man can live in it long. The FRUIT is used for making country

Fruit. 306 ink, and, by the Bhils, to poison fish (?) (*Lictard, Elliot*); the OIL as a

Oil 307 dressing for the hair. The LEAVES have been used as an antiseptic to

Leaves. 308 impregnate sleepers of *salai* (**Boswellia serrata**), which are said to have been rendered durable by soaking for five months in a tank filled with the leaves and water (*Indore Forest Rept., 1876-77*; *Conf.* Vol. I., 516). In

Wood ashes. 309 the *Gazetteer of Sawantwadi* (Bombay) the WOOD-ASHES are said to be much used in the manufacture of molasses (*Conf.* with **Saccharum—Sugar**, *Vol. VI., Pt. II., 301*).

310 **Terminalia bialata,** *Kurz; Fl. Br. Ind., II., 449.*

Syn.—PENTAPTERA BIALATA, *Roxb.*

Var. cuneifolia, *Wall.*

Vern.—*Leinben*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 383; Voigt, Hort. Sub. Cal., 36; Kurz, For. Fl. Burm., I., 456; Gamble, Man. Timb., 182; Agri.-Horti. Soc. Ind.: Trans., VII., 57.*

Habitat.—A large, deciduous tree, which attains the height of from 80 to 100 feet; found in Burma and the Andaman Islands.

TIMBER. 311 **Structure of the Wood.**—Grey, beautifully mottled, similar to the timber of **T. belerica**; weight 39lb per cubic foot (*Brandis, Burma List*), 48lb (*Gamble*). **Gamble** remarks that **Skinner's** No. 124 gives weight 64lb, and P. 1042, but he considers that there may have been some mistake in these figures.

312 **T. Catappa,** *Linn.; Fl. Br. Ind., II., 444; Wight, Ic., t. 172.*

INDIAN ALMOND.

Syn.—T. CATAPPA & BADAMIA, *Tulasne*; T. MOLUCCANA, *Lamk.*; T. MYROBALANA, *Roth.*; T. SUBCORDATA, *Willd.*; T. INTERMEDIA, *Spreng.*; JUGLANS CATAPPA, *Lour.*; CATAPPA DOMESTICA, LITOREA, & SYLVESTRIS, *Rumph.*; BADAMIA COMMERSONI, *Gærtn.*

Vern.—*Jangli-bádám, hindi-bádám, bádámi*, HIND.; *Bangli-badam*, BENG.; *Bádám*, URIYA; *Desi-badám*, N.-W. P.; *Hindi-bádám, jangli-badám, badáme-hindi*, DECCAN; *Bádám, jangli-bádám, bangáli-bádám, bádámi, desi-bádám*, BOMB.; *Bengali-bádám, jangli bádáma, nát-bi-dám*, MAR.; *Natvadom, nattuvadam-kottai, nathe-vadam-kottai, nattu-*

The Beleric Myrobalan. (*J. Murray*) TERMINALIA belerica.

MEDICINE. Drupe. 299 Kernel. 300

Medicine.—Belleric myrobalans (the DRUPE) are described by Sanskrit writers as astringent and laxative, and useful in coughs, hoarseness, eye diseases, etc. As a constituent of *triphala*, or the three myrobalans (T

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tonic,

digestive, attenuant and aperient, and useful as an application in inflammatory diseases of the eye. As long as the doctrines of the Arabian school prevailed, *myrobalans were used medicinally in Europe*, having been introduced by the Arabs from India. The μυροβαλανος of the early classical Greek and Lat
obtained oil for their unguent
oil palm (Elæis guineensis);
μυβαλανος and μυρεψικος
Indica). In modern Native practice the ancient Sanskrit and Muhammadan opinions are retained. Thus in the Panjab it is chiefly employed in dropsy, piles, diarrhœa, and leprosy; also occasionally as a remedy for fever. When half ripe it is considered purgative; when fully ripe or

an application in
pplication for the
Dymock states
imes eaten in the

FOOD. Fruit. 301 Kernel. 302

Food and Fodder.—The FRUIT is eaten, when fresh, by goats, sheep

toms during the day, but on the following morning was found to be insensible, aud suffering from all the symptoms of collapse Emetics and small

grains of the kernels was injected into a cat's stomach, on another 13½ grains (equal to about thirty-five to forty kernels) were administered to a

FOOD. starving cat, with, in both cases, negative results. These authors therefore regard their experiments as fairly conclusive that the kernels do not possess any toxic properties.

Leaves. 303 Stewart states that in Kangra the LEAVES are considered the best fodder for milch cows.

TIMBER. 304 **Structure of the Wood.**—Yellowish-grey, hard, no heartwood; similar in structure to that of **Ougeinia dalbergioides**; weight 43lb per cubic foot (*Kyd, from Assam experiments*), 39lb (*Cent. Prov. Lists*), 40lb (*Brandis, Burma List*), 48lb (*Gamble*). It is not durable, is readily attacked by insects, and is consequently of little value. It is, however, employed for planking, for making packing cases and canoes, and in the North-West Provinces for house-building after being steeped in water, which is said to have the effect of making it more durable. In the Central Provinces it is used for ploughshafts and carts when *bijasal* is not available. In South India it is employed for making packing cases, coffee boxes, catamarans, and grain measures.

DOMESTIC Tree 305 **Domestic and Sacred.**—The TREE is an excellent one for avenue purposes, but has many superstitions connected with it which interfere with its utility. Thus the Hindus of Northern India consider it to be inhabited by demons, and consequently avoid it, never sitting under its shade. In Central and Southern India the people will not use the timber for building, under the impression that a dwelling-house which contains it is fated, and that no man can live in it long.

Fruit. 306 The FRUIT is used for making country ink, and, by the Bhils, to poison fish (?) (*Lisbard, Elliot*);

Oil 307 the OIL as a dressing for the hair.

Leaves. 308 The LEAVES have been used as an antiseptic to impregnate sleepers of *salei* (**Boswellia serrata**), which are said to have been rendered durable by soaking for five months in a tank filled with the leaves and water (*Indore Forest Rept.*, *1876-77*; *Conf.* Vol. I., 516).

Wood ashes. 309 In the *Gazetteer of Savantvadi* (Bombay) the WOOD-ASHES are said to be much used in the manufacture of molasses (*Conf.* with **Saccharum—Sugar**, *Vol. VI., Pt. II.*, 304).

310 **Terminalia bialata,** *Kurz*; *Fl. Br. Ind., II.*, 449.

Syn.—PENTAPTERA BIALATA, *Roxb.*

Var. cuneifolia, *Wall.*

Vern.—*Leinben*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C.*, 383; *Voigt, Hort. Sub. Cal.*, 36; *Kurz, For. Fl. Burm.*, *I.*, 456; *Gamble, Man. Timb.*, 182; *Agri.-Horti. Soc. Ind.: Trans.*, *VII.*, 57.

Habitat.—A large, deciduous tree, which attains the height of from 80 to 100 feet; found in Burma and the Andaman Islands.

TIMBER. 311 **Structure of the Wood.**—Grey, beautifully mottled, similar to the timber of **T. belerica**; weight 39lb per cubic foot (*Brandis, Burma List*), 48lb (*Gamble*). Gamble remarks that Skinner's No. 124 gives weight 64lb, and P. 1042, but he considers that there may have been some mistake in these figures.

312 **T. Catappa,** *Linn.*; *Fl. Br. Ind., II.*, 444; *Wight, Ic.*, *t.* 172.

INDIAN ALMOND.

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Vern.—*Jangli-bádám, hindi-bádám, bádámi,* HIND.; *Bangla-bádám, [illegible]* BENG.; *Bádám,* URIYA; *Desi-badám,* N.-W. P.; *Hindi-bádám, bangali-badám, bádáme-hindi,* DECCAN; *Bádám, jangli-bádám, jangli bádámi, desi-bádám,* BOMB.; *Bengali-bádám, [illegible] bádám,* MAR.; *Natvadom, nattuvadam-kottai, nathe-vadam-kott[illegible]*

PERS

References.—R. Cal., 37; Brandis, Pegu Rept., app. A amble, Man Timb., vaites, En Ceyl. Pl Gibs., Bomb. Fl., 91 ıd Pl.,

I, 78, 81, 363; II., 19; III, 24, 202; VI., 323; IX, 239, 413; X 33, 325, 545; XI., 326; XII., 313; XIII, 121, 146, 164; XIV, 302; Spons', Encycl. II, 1087; Balfour, Cyclop. Ind., III, 850.

Habitat.—A large, deciduous tree, abundant in Northern India from

TERMINALIA Chebula.

Kumáon to Bengal and southward to the Deccan table-lands at 1,000 to 3,000 feet, also found in Burma, Ceylon, and the Malay Peninsula. In the Madras Presidency it is common all over the forests; in Coimbatore it is of large size; in Kanara and Sunda it abounds above the Gháts; in Ganjam and Gumsur it is tolerably plentiful; and it occurs in the Godáveri tracts. In Bombay it is common on the higher forests on and near the Gháts, and is very abundant in the forests of the highlands of the Satpurass and above the Gháts in Belgaum and Kanara.

GUM. Tree. 326

Gum.—The TREE yields a GUM which is said to be largely collected in the Berars, mixed with those of **Acacia arabica, Anogeissus latifolia, Bassia longifolia,** and **Melia Azadirachta.** The mixed gums of these trees are taken to local markets by the Gonds who collect them, and sold either for medicinal purposes or to dyers to mix with their colours (*P. W. Dept. Repts. on Gums, &c., 69*). The vernacular name given, *viz.*, *bey-a-rah*, seems to indicate that the above account may in reality refer to the gum of **T. belerica.**

DYE & TAN. Fruit. 327 Galls. 328 Leaves. 329

Dye and Tan.—The dried FRUIT forms the "chebulic" or "black" myrobalan of commerce, one of the most valuable of Indian tanning materials. In India it is occasionally used as a dye by itself, the rind of the fruit being powdered and steeped in water. The cloth steeped in this infusion acquires a dirty grey colour. With alum both the fruit, and the GALLS produced in quantity on the LEAVES, are said to give with alum a good permanent yellow. But the most extensive use to which *harra* is put as a dye is in the production of various shades of black in combination with some salt of iron, generally the protosulphate. In some cases *gúr* or molasses is added, in others a little indigo is mixed with the dye to give depth to the colour. In Dacca a deep black is obtained by using *gáb*, the dried fruit of **Diospyros Embryopteris,** in combination with chebulic myrobalan and ferrous sulphate. In Chutia Nagpur a dark neutral tint called *kakraiza* is obtained from *harra*, protosulphate of iron, and safflower. In Chittagong the fruit is mixed with *tiri* pods (**Cæsalpinia Sappan**) to produce a black dye. A mixture of the fruit and ferrons sulphate in certain proportions also produces a *khaki* or iron-grey colour (*McCann*). In Madras it is used in the same way, also alone for dyeing cotton, wool, and leather. In the North-West Provinces the chief shades, in producing which the fruit plays a part, are black, as above described; green, in company with turmeric and indigo; dark blue, with indigo, and brown with catechu. Excepting in the case of black it acts more as a concentrator of colour than as contributing much colour of its own (*Sir E. C. Buck*). It is commonly employed throughout the country as a mordant, or accessory, to concentrate the colour in dyeing with safflower, *ál* (**Morinda citrifolia**), *manjít* (**Rubia cordifolia**), *huldi* (**Curcuma longa**), and *tesu* (**Butea frondosa**). With iron-salts it is employed in making country ink, and mixed with ferruginous mud it makes a black paste employed by harness and shoe-makers as well as by dyers. The BARK is also occasionally used for dyeing *khaki* grey and black, and in Bengal and Manipur for dyeing bamboos. A sample of the fruit examined by **Mr. Wardle** was found to produce very dark shades of grey when mixed with salts of iron, on *tasar*, *corah* and *eri* silk, and wool.

Bark. 330

A sample of the bark was ascertained to be very astringent and to produce shades of colour much like those obtained from *babul* pods, but of a somewhat yellower tone. The shades on unbleached Indian *tasar* varied from yellow-drab to slaty-drab, on bleached Indian *tasar*, *eri* silk, *corah* silk, and wool they were a yellowish drab. The galls were found to contain 13·1 per cent. of tannic acid and to produce a light yellow on wool.

The chief commercial value of chebulic myrobalan is, however, as a tanning material; it forms the greater part of the ground myrobalans of

DYE & TAN.

commerce, though belleric myrobalans are occasionally mixed with it. The liquor prepared from it is not only a powerful tan, but imparts a bright colour to the leather, and is hence highly esteemed to mix with other tanning agents (*Conf.* Leather, Vol. IV., 607). Thus Professor Hummel, in his report on Indian Tans at the Colonial and Indian Exhibition of 1886, writes: "Ground myrobalans are becoming more and more a favourite tannin matter, and practically combine every desirable excellence" At the Tanning Conference held at that Exhibition much interest was naturally evidenced in a product of so great value, and several facts of much moment to the success and future extension of the Indian trade ... the report, issued at the close

Commercial Forms. 331

... recognise and give the trade ... ey pointed out that Terminalia Chebula must never be round or spongy in texture. The good qualities

...

pur form of myrobalans was viewed as superior; and Mr. Evans picked out specimens of what he regarded as the best quality shown, in order to compare these with myrobalans procured in London." "Two samples of

...

valueless. A number of other tanning materials were examined, but none seemed to afford sufficient interest to deserve special mention.

...

examinations.

"When asked what might be recommended to Government, it was stated that the only thing that could be done was to experiment with the production of extracts or half-stuffs, so as to overcome the heavy charges

Results of Experiments. 332

...

"The writer gave the above samples to Dr. Paul personally ... and

The Chebulic Myrobalan—

DYE & TAN.

Results of Experiments.

being correct. Moreover, those present at the Conference condemned the sample No. 3 as a very inferior quality of the true myrobalan. Other experts received corresponding samples, and their reports, had they been received, would have been most valuable as placing this matter beyond the possibility of doubt. Dr. Paul's analysis, however, of Nos. 2, 3, and 6 so completely confirm the observations and valuations made by the experts present at the Conference, that the theory then advanced, regarding the superior quality of the oblong, pointed, and solid fruits, as compared with the round inflated ones, will most probably be found correct, *viz.*, that myrobalans picked off the same individual tree during different stages of their growth will be found to have a varying composition of from 6 to 30 per cent. of gallo-tannic acid. And this theory is supported by a volume of evidence in the history of all fruits, and particularly by Professor Hummel's observation, that in the case of **T. belerica** the tannic principle resides chiefly in the outer pulp of the myrobalan. The transformation from the bitter unripe apple to the ripe, sweetly-flavoured fruit, is so well known as to scarcely require mention. This being so, it would seem desirable to institute a thorough enquiry into the subject of these valuable tanning materials which would have two objects in view—(*a*) to determine the exact age in each locality when the maximum amount of tannic acid is present; and (*b*) the properties and value of the fruits of one district as compared with those of another. In a country with so many different climatic features, and such widely diversified peculiarities of soil as India, it neither follows that the fruits will reach their perfection at the same time in various localities, nor even that different climates and soils will, when this point has been determined, produce fruits of equal merit. Were these questions determined, it would be possible for Government to encourage, with reasonable hope of success, the development of a large myrobalan trade; and for merchants to depend upon a good supply of superior fruit. As matters stand, no dependence can be put on the supply or the quality of Indian myrobalans. In the trade a form of the true myrobalan is known as the Jubbulpur myrobalan; and this may literally be grown at Jubbulpur, or may be but a form or condition of maturity first sent to Europe from that district—that quality continuing to bear the name in spite of the fact that it may be obtained from many other localities. So very much superior are these oblong, pointed, solid, and pale green fruits to the large rounded samples, that several of the experts seemed to feel hurt that their belief should be questioned that these were not the fruits of a different species" (*Sel. from Rec. Govt. of Ind., Rev. and Agri. Dept., I.,* 89).

A sample from the Central Provinces (similar to that furnished as No. 2 in Dr. Paul's set) was analysed by Professor Hummel, and was found to contain 31 per cent. of tannic acid. The decoction it produced was of a pale-yellow colour. The money value per cwt., as compared with ground myrobalans at 7*s.* 6*d.* per cwt., was 10*s.* 1*d.* The analysis of an average sample of commercial ground myrobalans by the same author revealed 23 per cent. of tannic acid, while the decoction differed from that of the unadulterated fruit in being turbid. Professor Hummel remarks that he did not observe such a distinction of parts as that found in **T. belerica**, in the chebulic myrobalan, but it is worthy of notice that Crookes, in his account of the tan quoted below, states that the kernel is inert.

The difference in quality of myrobalans at different seasons of the year is, as Dr. Watt remarks, of the utmost importance. The following account of the appearances and properties of the fruit when in the best condition taken from Crookes' *Handbook of Dyeing*, may, therefore, be found a useful guide towards meeting the requirements of the market:—"In shape and size myrobalans somewhat resemble shrivelled plums. They are of a

DYE & TAN

Results of Experiments.

pale buff colour, consisting of a dry pulp, varying in thickness, and enclosing a stone-like kernel, which contains no tannin, and forms from 23 to 52 per cent. of the whole weight. The moisture present in the nuts, as found in commerce, varies from 3 to 7 per cent., and the amount of ash left on incineration is about 10 per cent. The tannic acid is mainly present in the pulp. Good unground myrobalans should be pale, plump, free from dark blotches and from worm-holes. They should be hard and *firm, ringing like fragments of earthenware when shaken together, and if* crushed with a hammer yielding a dry, pale powder, mixed with hard irregular fragments. If they can be crushed to a dark-coloured dust between the fingers, or if they work out into a paste under the pestle, they are of poor quality. Ground myrobalans should form a pale buff powder, dry, astringent to the taste, but free from a saline flavour or from intense bitterness. If moistened and rubbed in the hand, they should form a

to a very great extent, superseded both. Along with salts of iron, they dye cotton a fuller black than can be obtained with sumac. They are likewise preferred to sumac for fixing the coal-tar colours upon cotton, owing possibly to the fact that they contain, along with tannin, certain oily and glutinous matters. Gall-nuts and commercial tannin are, however, still preferable."

Indian Supply. 333

SUPPLY.—As already stated, the tree is found all over the forests of the Madras Presidency, and on the high table-lands and ghâts of Bombay. It is also met with abundantly in the highlands of the Satpura range, Central Provinces; in Palamow and Hazáribágh, Bengal (*Beng. Govt. Rept*, *1880*), "more or less common all over Bengal" (*McCann*); in the Sub-Himálayan tracts of the North-West Provinces, and through-

had the advantages claimed for it:—(1) that it provided legitimate and well paid employment for many people; (2) that by enlisting the interest

The Chebulic Myrobalan—

DYE & TAN. Indian Supply.

of the people it would tend greatly to reduce risk of forest-fires; and (3) that it did away with a great deal of oppression and bad treatment on the part of the former holders of the right to collect.

At the same time large quantities of fruit were sown in the reserves, resulting in a thick new growth of *hirda* all over the forests. The revenue derived from the fruit in other localities is comparatively small.

The Forest Administration Report for the Southern Circle during the past year shows the outturn and value of *hirda* collected by Government agency to have been as follows:—

Division.	Outturn.		Receipts.		
	Khandis.	Maunds.	R	a.	p.
North Kánara	1,901	...	18,779	15	9
Central Kanara	366	...	3,893	4	9
South Kánara	2,131	...	21,846	1	9
Belgaum	6,608	...	56,723	8	0
Kolába	(Returned under "Minor forest produce.")		700	0	0
Ratnagiri	...	34	38	12	0
TOTAL	11,006	34	1,10,981	10	3

In the Northern Circle the total yield was 1,386 khandis, 25 maunds 2 seers, which fetched R26,893-2-1. The cost of collection, &c., is estimated to have been R13,593-11-2. The revenue derived from sale of the fruit in other Presidencies and Provinces is very much smaller, and cannot be definitely arrived at owing to the practice of including it with other articles under the general heading of "Minor produce." In the Southern Circle of Madras 28 tons 1,678lb are said to have been collected by departmental agency and sold for R901-2-9. In the Northern Circle myrobalans are not separated from other minor produce. In the case of the Central Provinces, the largest myrobalan-producing area in India, it is impossible, owing to myrobalans not being accurately separated from other minor forest produce in the returns, to give any idea of the amount collected from Government Forests. It will be observed below that the returns of internal trade show a very large export of myrobalans from these Provinces.

The Forest Administration Report of Bengal for 1888-89 shows a similar want of returns for myrobalans. Only one mention is made of the fruit, apart from other minor produce, from which it would appear that 20 maunds were removed by purchasers, from the Hazáribágh subdivision of Chutia Nagpur, on payment of R20, or R1 per maund. The system of collecting the fruit departmentally does not appear to have been adopted in the Lower Provinces. McCann states that the prices given, as a rule, for myrobalans in the various districts, are:—R2-8 per maund in Midnapur, R3 in Rájsháhi, R5 in Chittagong, R2-8 in Monghyr, about R2 in Cuttack, R5 for *jeonghi harra*, or large, picked, unripe fruit, and R1-4 for ordinary *harra* in Chutia Nagpur, and R3-8 to R5 in Palamow. In a report from the Bengal Forest Department (1880), however, cited by

Liotard, the prices are given at 10 annas 8 pie per maund in Palamow, DYE & Tan. *Indian Supply.*

ince may be obtained from figures for 1874-75 given by Sir E. C. Buck. According to these the exports from the forests of Najibabád, Rehár, Dehra Dun, Garhwál, and Kumáon amounted to 451 cwt. of large fruit, valued at R974; and 205¾ cwt. of small, valued at R2,016. No approximate of the outturn in other localities can be hazarded. It must also be remembered that the figures of internal trade conclusively show that the amount collected by, or under the supervision of, the Forest Department, is very small in comparison with the large quantity which comes into the market. It would, in fact, appear that in Bombay only has the matter received sufficient attention to be productive of a noticeable revenue to that Department.

TRADE. 334

forming much the largest proportion of the material represented by the trade figures.

INTERNAL. Internal. 335
rail, road, and
myrobalans fr

a marked tendency to increase, as will be seen by the following quinquennial averages:— Foreign. 336 Exports 337

Five years ending	Quantity.	Value.
	Cwt.	R
1879-80	416,189	17,30,812
1884-85	435,962	17,52,036
1889-90	678,502	26,85,495

The year of maximum export was the first part, 1889-90, when a total of 781,741 cwt., valued at R31,75,330, was reached. The distribution of

YE & TAN.

Foreign Trade.

Exports.

the exports, and the share taken by each seaboard Presidency or Province, in the trade, during that year is shown by Mr. O'Conor as follows:—

Countries to which exported.	Quantities.	Value.	Share of each Presidency or Province. Presidency or Province.	Quantities.	Value.
	Cwt.	R		Cwt.	R
United Kingdom . .	633,235	25,82,944	Bengal .	25,009	73,447
Austria . . .	90,512	3,65,898	Bombay .	643,178	27,93,381
Belgium . . .	13,738	58,376	Madras .	113,554	3,08,502
France . . .	3,745	13,891			
Germany . . .	16,873	57,501			
Italy	12,418	48,574			
Russia . . .	4,796	20,883			
United States . .	525	1,607			
Australia . . .	5,709	24,815			
Other Countries . .	190	841			
Total .	781,741	31,75,330		781,741	31,75,330

The trade will thus be seen to be almost entirely between Bombay and the United Kingdom.

Imports. 338 One of the most curious facts in connection with myrobalans is the existence of a small import trade into India. It is difficult to understand why this should be so, in the case of a country in which the tree grows so plentifully and in which the fruit may be obtained so cheaply. During the three quinquennial periods ending 1879-80, 1884-85, and 1889-90, the average imports amounted to 1,330 cwt., valued at R5,498, 3,072 cwt., valued at R10,524, and 3,751 cwt., valued at R11,759. This trade is almost entirely between Ceylon and Madras.

OIL, Kernels. 339 **Oil.**—A clear, transparent, almost colourless, fluid OIL is obtained in small quantities from the KERNELS. It is used medicinally.

MEDICINE. **Medicine.**—The chebulic myrobalan was highly extolled by the ancient Hindus as a powerful alterative and tonic. It has received the names of *Prânadá* or life-giver, *Sudhá* or nectar, *Bhishakpriya* or physician's favourite, and others of the same nature. Seven varieties of *haritákí* are described, of which only two are at present recognised, the large ripe FRUIT called *haritákí*, and the unripe fruit called *jangi haritákí*. A good *haritákí*, fit for medicinal use, should be fresh, smooth, dense, heavy, and round in shape. Thrown into water it should sink. Any fruit, however, which weighs over four tolas, is considered fit for use, although it may not possess some of the other properties. Fruit with small seeds and an abundant pulp is preferred; the seed is always rejected. Chebulic myrobalans are described as laxative, stomachic, tonic, and alterative. They are used in fevers, cough, asthma, urinary diseases, piles, intestinal worms, chronic diarrhœa, costiveness, flatulence, vomiting, hiccup, heart diseases, enlarged spleen and liver, ascites, skin diseases, &c. In combination with emblic and beleric myrobalans, under the name of *triphalá*, or the three myrobalans, they are extensively used as adjuncts to other medicines in almost all diseases. As an alterative tonic for promoting strength, preventing the effects of age and prolonging life, chebulic myrobalan is used in a peculiar way. One fruit is taken every morning with salt in the rainy season, with sugar in autumn, with ginger in the first half of the cold season, with long pepper in the second half, with honey in spring, and with treacle in the two hot months (*Hindu Mat. Med.*). Numerous prepara-

Fruit. 340

MEDICINE

tions prescribed by Chakradatta and other old Sanskrit writers are detailed at length by U. C. Dutt, to whose work the reader is referred for further information.

Myrobalans were known to the early Arabian writers and, through

corn (*jao*)

still further advanced stage of the fruit, which, when dried, is the size of a raisin, and black; hence the names *zengi*=negro, and *aswed*=black. (4) *Halileh*-

tify the fruit as that of T. Chebula. Commenting on the above description from the *Makhzan* he writes: "The *zengi-har* is, as far as I can learn, more frequently used in medicine by the Hindus than any of the other myrobalans, being very generally employed by them as a purgative. It operates briskly, but without occasioning heat or irritation. Persons liable to redundancy of bile, habitual costiveness, or any

e

phlegm, and adust bile; it should be combined with aromatics, such as fennel seeds, carraways, &c. The Arabs say '*Ihlilaj* is in the stomach like an intelligent housewife who is a good manager of the house.' The unripe fruit (*Halileh-i hindi* or *Himaja*) is most valued on account of its

or sugar."

as found in the country, endorsing the information on the subject previously given by Garcia d'Orta. These, he states, were used for tanning leather as "tanners use sumach." The first and last of his five sorts "by physitions called *Citrinos* and *Quebulus*, by the Indians *arare* and

The Chebulic Myrobalans.

MEDICINE.

areleau," appear to have been undoubtedly chebulic myrobalans. These, he describes, as having been much used medicinally and as a food. His commentator, **Dr. Paludanus**, states that all five kinds were regularly imported from India in his time, either dried, pickled or preserved in sugar. He describes *citrinos* as yellow, and valuable as purging the stomach from bile, and "good against Tertians and other hot-burning Feavers." **Linschoten's** *Quebulus* he calls *cepule* or *chebulæ*, writing, "the greater they are the better. Blackish, and somewhat reddish, heavie and sinking into the water, they purge fleame, they sharpen men's wits and clear the sight. They are preserved in sugar and honnie, they doe strengthen and purge the stomach, they heale the dropsie and are good against olde agues, they likewise give a man an appetite and help digestion."

Linschoten's other kinds he identifies as *Bellericos* (**T. belerica**), *Emblicos* (**Phyllanthus Emblica**), and *Inelus*, the last of which from its name and description is probably the *halileh-i-hindi* or black chebulic myrobalan above mentioned. On the awakening of interest in Indian Materia Medica towards the end of last century, myrobalans again and naturally attracted attention. **Fleming**, with the help of **Roxburgh**, was able to botanically identify the *phar* of the bazárs, and in an interesting and exhaustive article on the subject, recommended it as a gentle purgative. **Ainslie** noticed its value in the preparation of an application for aphthæ in children and adults. **Buchanan-Hamilton** described it as a valuable purgative and recognised its value as a tanning material; he recommended that it should be more generally planted, and its growth encouraged, near villages. He also noticed an interesting medicinal use of the fruit by Natives. "Men who have made a vow of chastity," he writes, "and who are inclined to adhere to their resolution, endeavour to assist their virtue by eating this preserve, which is supposed to diminish the desires of the flesh." **Hove**, in his account of a visit to the myrobalan plantation at Bungar in the Konkan in 1787, states that he found one fruit a sufficient purgative, though the manager of the plantation told him that two were generally used.

On the compilation of the *Pharmacopœia of India* in 1868, the fruit was admitted to a place on the secondary list, where much valuable testimony as to its properties is detailed. **Waring**, the editor, found that six fruits, bruised and given in decoction, acted efficiently and safely as a purgative, producing four or five copious stools, unattended by griping, nausea, or other ill effects. **Dr. Oswald** recommended a similar preparation as an application or injection for hæmorrhoids and vaginal discharges. **Rajah Kalikissen** extols their virtues and regards them as combining mild purgative, with carminative and tonic properties. **Twining** (*Diseases of Bengal, I.*, 407) speaks very favourably of them in the same character, and expresses surprise that a medicine with such useful properties should be so little known in Europe. He gives a case of enlargement of the spleen, in which it was productive of good effect. The **Rev. J. Kearns** of Tinnevelly is quoted as testifying to the efficacy of the GALLS in dysentery and diarrhœa, especially in infantile diarrhœa, the dose for a child of one year old being one grain every three hours (*Pharm. Ind.*). More recently the authors of the *Pharmacographia Indica* add their evidence in favour of the value of the fruit, stating that they have found it useful in dysentery and diarrhœa. It is therefore very remarkable that a medicine of such reputed value should have been allowed to drop out of European practice. Nothing appears to have been done in the way of accurately determining its physiological action, at least since the days of **Paludanus**, who wrote: "It purges in another kind of manner than doth Cassia, manna or such like drug, but it does it by astriction or

Galls.
341

MEDICINE.

binding." It is quite possible that its action may be that of a nervo-muscular stimulant like Nux-vomica, certainly the most valuable class of purgatives in the treatment of Indian diseases. This quality, combined with its astringency, would render it valuable for diarrhœa and dysentery as stated by the authors of the *Pharmacographia Indica*. Recently M. P. Apery has brought to the notice of the profession in Europe the value of the drug in dysentery, choleraic diarrhœa, and chronic diarrhœa; he administers it in pills of 25 centigrammes each, the dose being from four to twelve pills or even more in the twenty-four hours (*Pharmacog. Ind., quoting Jour. de Pharm. et de Chim., Feby. 1st, 1888*). It is, therefore, possible that the therapeutic value of myrobalans may before long form the subject of systematic investigation.

Chemistry. 342

CHEMICAL COMPOSITION.—The question of the percentage of gallo-tannic acid, contained in the fruit, has already been dealt with (see paragraph **Dye and Tan**, p. (?)). In 1884 Herr Fridolin reported the isolation from the fruit of a new organic acid which he called *chebulinic acid*, and considered to be probably the source of the gallo-tannic acid detected by previous observers. He suggests as a formula to represent its composition $C_{28}H_{24}O_{19}$ ($C_7H_6O_5$?). When decomposed by heating an aqueous solution in a closed tube it takes up the elements of water and the molecule splits up into two molecules of gallic acid and one of tannic acid. According to M. P. Apery black myrobalans contain an oleo-resin of a green colour, soluble in alcohol, ether, petroleum spirit, and oil of turpentine. He has called it *myrobalanin* (*Pharmacog. Ind., from Jour. de Pharm et de Chim., Feby. 1st, 1888*).

SPECIAL OPINIONS.—§ "Preserve of *Harar*, *Murabha-Harar*, often used as aperient and taken at night by the Natives" (*Civil Surgeon J. C. Penny, M.D., Amritsar*). "The kernels commonly eaten raw" (*Brigade-Surgeon G. A. Watson, Allahabad*). "A conserve of the fruit is used as digestive. It can be used in diarrhœa and indigestion. It acts also as a mild laxative" (*Surgeon R. L. Dutt, M.D., Pubna*). A fruit, coarsely powdered and smoked in a pipe, affords relief in a fit of asthma. A decoction of the fruit is a good astringent wash. A fine paste, obtained by rubbing the fruit on a rough stone with little water, mixed with the carron oil of the Pharmacopœia and applied to burns and scalds, effects a more rapid cure than when carron oil alone is used" (*Surgeon-Major D. R. Thompson, M.D., C.I.E., Madras*). "The fruit with senna and confection of roses is an effective laxative" (*W. Forsyth, F.R.C.S., Edin., Civil Medical Officer, Dinajpore*). "It is very largely used in Native medicine, and forms an ingredient of most Native prescriptions. Water in which the fruits are kept for the night is considered a very cooling wash for the eyes. When cleaned the fruits form a common dentifrice. The ashes, mixed with butter, form a good ointment for sores" (*Surgeon-Major Robb, Civil Surgeon, Ahmedabad*). "An effective purgative used in the form of decoction combined with cinnamon or cloves - myrobalans, six in number; cinnamon or cloves, one drachm; water four ounces. Boil for ten minutes and strain. The whole quantity for a dose in the early morning. The gall like excrescence on the leaves (*Kadu-kai-pio*) is also used at the hospital in the following formulæ and found useful as an astringent in cases of diarrhœa, especially in children. Pulv. terminal gall excrescence, one ounce; Pulv. cinnamon, one ounce; Pulv. catechu, half ounce; Pulv. nutmeg, half ounce—mft. Dose: from ten to twenty grains for an adult" (*J. G. Ashworth, Apothecary, Kumbakonam, Madras*). "Astringent. A decoction ʒiss-½ to ʒi is useful as a gargle in sorethroat and as a wash for piles" (*Surgeon-Major A. F. Dobson, M.B., Bangalore*). "Commonly used as an astringent, generally in combination with

gall-nuts, etc. It is also chewed by old people together with catechu to tighten their teeth" (*Civil Surgeon M. Robinson, Coorg*).

FOOD. Food and Fodder.—The FRUIT when ripe is occasionally eaten. The

Fruit. 343 oily KERNEL, like those of other species of the genus, tastes like a filbert, and

Kernel. 344 is used as an article of food. The LEAVES are eaten as a fodder by cattle.

FODDER. Leaves. 345

TIMBER. 346 Structure of the Wood.—Brownish-grey, with a greenish or yellowish tinge, very hard, fairly smooth and close-grained, durable, and seasons well. It has no regular heartwood, but irregular masses of dark purple occur frequently near the centre. The weight has been variously given by different writers at from 42 to 66lb per cubic foot, the value of P. at 825 to 1090. It takes a good polish and is fairly durable, though, according to Beddome, cross-grained and difficult to work. It is used for making furniture, carts, agricultural implements, and for house-building, and has been tried for sleepers in Bengal.

DOMESTIC. Domestic and Sacred.—So highly esteemed is the tree that a mythological origin was assigned to it by the ancient Hindus. It is said that when Indra was drinking nectar in heaven, a drop of the fluid fell on the earth and produced the *haritaki* plant. The fruit and galls are used for making

Ink 347 country INK, and a black DYE for staining the teeth. The former is a

Dye. 348 constituent of an excellent preparation for preserving skins, commonly employed by sportsmen in India.

349 **Terminalia citrina**, *Roxb.; Fl. Br. Ind., II., 446.*

Syn.—MYROBALANUS CITRINA, *Gartn.*

Var. malayana, *Kurz.*

Vern.—*Haritaki, harra*, BENG.; *Hilika, silikka, silika.* ASSAM; *Horlaki*, CACHAR; *Harika, harira*, N.-W. P.; *Kyú*, BURM.

References.—*Roxb., Fl. Ind., 382; Voigt, Hort. Sub. Cal., 37; Brandis, For. Fl., 123; Kurz, For. Fl. Burm., I., 456; Gamble, Man. Timb., 181; O'Shaughnessy, Beng. Dispens., 340; Darrah, Note on Cotton in Assam, 30; Liotard, Dyes, 94, 116; McCann, Dyes & Tans, Bengal, 35, 152; Agri.-Horti. Soc.:—Ind., Trans. VII., 57, 58; Journ, IV., 124, 134; VI., 71.*

Habitat.—A large, deciduous tree of Assam, Eastern Bengal, Burma, and Tenasserim. Considerable confusion exists in Indian economic literature between this species and **T. Chebula**, of which the appearance and vernacular names are very similar. It differs from the latter in having a straight stem, brighter foliage, and narrower fruits. The fruit is described as nearly 2 inches long, oblong-lanceolar, and while fresh, obscurely five-angled. **Mr. C. B. Clarke** regards it as doubtfully a distinct species from **T. Chebula**.

DYE & TAN Fruit. 350 Dye and Tan.—The FRUIT is doubtless frequently used in the same way as that of **T. Chebula**. In Assam the BARK is said to be employed in pro-

Bark. 351 ducing a black dye; in Monghyr the fruit is used as a mordant in dyeing with *al.*

MEDICINE. Medicine.—The medicinal properties of this species are probably similar to those of the chebulic myrobalan. Mention is made by Fleming

Fruit. 352 and various other writers of the FRUIT, as distinct from that of **T. Chebula**, being used medicinally, but in all probability they refer to the old MYROBALANUS CITRINA of the shops, a form of chebulic myrobalan. **Roxburgh** is probably correct in stating that the fruit of this species is not so distinguished in Hindu Materia Medica, and that both are employed indiscriminately.

TIMBER. 353 Structure of the Wood.—Grey, darker towards the centre, hard, similar to that of **T. Chebula**; weight 60lb per cubic foot (*Wallich*), 49lb (*Gamble*). In Assam it is used for making planks, and for general purposes of construction.

T. glabra, *See* **T. tomentosa**, *Bedd.*

Terminalia myriocarpa, *Heurck. & Muell.-Arg.; Fl Br. Ind., II.,* [448.

Syn.—PENTAPTERA SAJA, *Wall.*

Vern.—*Panisaj*, NEPAL; *Sungloch*, LEPCHA; *Hollock*, Ass

References.—*Kurz, For Fl. Burm., I., 457, Gamble, Man. Timb., 185; Ind. Forester, VIII., 416, XI., 355.*

Habitat.—A very large, evergreen tree, abundant in the subtropical valleys of Sikkim and Bhutan, between 1,000 and 3,000 feet, also met with in the Assam hills and Ava.

Structure of the Wood.—Sapwood white, not broad; heartwood brown, beautifully mottled with dark streaks, similar to that of T. tomentosa; weight 51 to 54℔ per cubic foot. Used for building and tea-boxes, also for charcoal. Gamble writes, "A specimen cut from a log of wood which had been lying for many years in the bed of the Chauwa Jhora, near Sivoke, in the Darjiling Terai, and is now perfectly black, may be this species." TIMBER. 354

T. paniculata, *Roth.; Fl. Br. Ind, II., 448.* 355

Syn.—T. MONOPTERA, *Roth.*; T. TRIOPTERA, *Heyne*, PENTAPTERA PANICULATA, *Roxb.*; HIPTAGE SP., *Wall.*

Vern.—*Kinjal, kindal*, BOMB., *Kinjal, kindal*, MAR; *Pe-karakai*, TAM.; *Nimiri*, TEL.; *Honal, hulund, kulvé, hunáb*, KAN.; *Pu marda, pillai marda*, ANAMALAIS; *Marma*, S. KANARA; *Pilla-murda*, MALAY

References.—*Roxb., Fl. Ind., Ed. C.B.C., 384, Voigt, Hort. Sub Cal, 38; Brandis, For. Fl., 226, Beddome, Fl Sylv, A. 20, Gamble, Man. Timb., 182; Dals. & Gibs., Bomb. Fl., 92; Elliot, Fl. Andhr., 134, Dymock, Mat Med. W. Ind, 2nd Ed., 323; Lisboa, U. Pl. Bomb, 75, 244; Birdwood, Bomb. Pr., 331; Liotard, Dyes, 22, Madras, Man Adm., I, 313; Gazetteers:—Mysore & Coorg, I., 60, Bombay, XV., 33; Ind. Forester, II., 19; IV., 292; XII., 313 Agri.-Horti Soc, Ind.:—Trans., I., 11, 12, 46, 47; VII., 57; Journ., VI, 25, 37.*

Habitat.—A large tree, common on the lower hills from Bombay to Cochin, also met with in the Nilghiri and Coorg mountains.

Dye and Tan.—The BARK contains tannin, and the FRUIT is a myrobalan (*Liotard*). Both are said to be used for dyeing and tanning, but litte information is available regarding them. DYE & TAN. Bark. 356 Fruit. 357

Medicine.—"The country-people use the JUICE of the fresh FLOWERS, rubbed with *parwel* root (Cocculus villosus) as a remedy in cholera, and in poisoning with opium. Four tolas of the juice, with an equal quantity of guava bark juice, is given frequently. In parotitis, the juice with *ghi* and *saindhav* (rock salt) is applied. In cholera about 4 tolas of the juice with an equal quantity of *parwel* root is given every hour" (*Dymock, Mat. Med. W Ind.*). MEDICINE. Juice 358 Flowers. 359

Structure of the Wood.—Weight 37 to 65℔ per cubic foot, valuable, though not quite so good as that of T. tomentosa. It is said to be improved by immersion in water, after which it becomes more durable It makes good planking, and in Ratnaghiri is used for making the handles of ploughs (*Gamble; Beddome; Brandis*). TIMBER. 360

Domestic.—This tree and T. tomentosa are said to be the principal fuel of the *ráb* or ash manuring used in agriculture throughout the Ratnaghiri district. DOMESTIC. Manure. 361

T. tomentosa, *Bedd.; Fl. Br. Ind., II., 447.*

Var. 1, typica,—T. TOMENTOSA, *W & A., Prodr; Wight, Ic, t 195;* T. GLABRA, *var.* TOMENTOSA, *Dals. & Gibs.*; T. ALATA, *Roth*; T. OVATA, *Herb. Rottler*; T. CHEBULA, *Retz.*, β, MINOR, *Heurck & Muell. Arg.*; PENTAPTERA TOMENTOSA, *Roxb.*

Var 2, crenulata,—T CRENULATA, *Roth*; PENTAPTERA CRENULATA, *Roxb.*; P. MACROCARPA, *Wall.*

TERMINALIA tomentosa.

The Asna or Saj Tree—

Var. 3, coriacea,=T. CORIACEA, *W. & A.*; PENTAPTERA CORIACEA, *Roxb.*

Vern.—*Saj, sein, ásan, ássain, ásna, sadri, sain, ain,* HIND.; *Piásál, piáshál, usán, asan, áshán,* BENG.; *Hatana, matnak',* KOL.; *Atnak',* SANTAL; *Amari,* ASSAM; *Jhan,* RAJBANSHI; *Taksor,* LEPCHA; *Saháju, kala saháju, sáj, ansun,* URIYA; *Barsaj, sáj, sadur, sája, sijra,* C. P.; *Maru,* GOND; *Madge,* BHIL; *Ain, saddra,* BERAR; *Athna,* MELGHAT; *Ság, hág, sader, saddr, sádri, hadri,* NIMAR, GUZERAT, and adjoining parts of MEWAR; *Sain, ásin, asain, sáj,* N.-W. P.; *Sain, ásun, arjan, ásan, sein, aisan,* PB.; *Karkaya, sadora, holda, dudia maddi, jangli-karanj,* DECCAN; *Ain, sádada, ásna, sag, sadri, marthi, kenjal,* BOMB.; *Ain, madat, yén, sádada, sáj,* MAR.; *Ain,* GUZ.; *Karra marda, kará maráthú, anemúi, kurruppu-maruta, marutai, karu-maradu,* TAM.; *Maddi, halla naddi, nella-madu, nalla-maddi,* TEL.; *Murada, kali maruthai,* ARCOT; *Kurakaya, sadora, holda, dudi maddi,* HYDERABAD; *Matti, kari-matti, banapu, tore matti madi aini,* KAN.; *Karu-maruta,* MALAY.; *Toukkyan, taukkyan, hpan-kha,* BURM.; *Chou-chong,* TALEING; *Kúmúk, kúmbúk,* SING.; *Asana,* SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 383; Voigt, Hort. Sub. Cal., 38; Brandis, For. Fl., 225; Kurz, For. Fl. Burm., I, 458; Beddome, Fl. Sylv., t. 17; Gamble, Man. Timb., 182; xx.; Cat., Trees, Shrubs, &c., Darjeeling, 39; Thwaites, En. Ceyl. Pl., 104; Trimen, Sys. Cat. Cey. Pl., 32; Dalz. & Gibs., Bomb. Fl., 91; Stewart, Pb. Pl., 88; Rev. A. Campbell, Rept. Econ. Pl. Chutia Nagpúr, No. 7550; Graham, Cat. Bomb. Pl., 96; Sir W. Elliot, Fl. Andhr., 125; Pharm. Ind., 89; Ainslie. Mat. Ind., II., 193; O'Shaughnessy, Beng. Dispens., 340; Irvine, Mat. Med. Patna, 118; Moodeen Sheriff, Supp. Pharm. Ind., 243; U. C. Dutt, Mat. Med. Hind., 292; S. Arjun, Cat. Bomb. Drugs, 53; Bidie, Cat. Raw Pr., Paris Exh., 29, 112; Dymock, Mat. Med. W. Ind., 2nd Ed., 322; Baden Powell, Pb. Pr., 587; Drury, U. Pl. Ind., 420; Atkinson, Him Dist. (X., N.-W. P. Gaz.), 310, 815; Useful Pl. Bomb. (XXV., Bomb. Gaz.), 75, 393; Gums & Resinous Prod. (P. W. Dept. Rept.), 2, 5, 7, 8; Liotard, Dyes, 22, 36; App. ii.; Wardle, Dyes, 8, 16; Cooke, Gums & Resins, 27; McCann, Dyes & Tans, Beng., 136, 151-52, 154, 160, 161, 162, 165, 167, 168, 169; Geoghigan, Silk in India, 139; Watt, Selections, Records Govt. India (R. & A. Dept.), 1888-89, 87, 88, 93, 98; Man. Madras Adm., I., 313; Nicholson, Man., Coimbatore, 401; Moore, Man., Trichinopoly, 80; Gribble, Man., Cud-dapah, 14, 262; Aplin, Rept. on Shan States, 1887-88; Settlement Re-port:—Central Provinces, Nimár, 305; Upper Godávery, 36, 37; Raepore, 75, 77; Seonee, 9; Gazetteers:—Bombay, VII., 31, 36, 39; XV., 33, 78; XI., 23; XVI., 18; XVII., 19; XVIII., 41, 48; XXII., 23; Panjáb, Ho-shiarpur, 11; N.-W. P., IV., lxxi.; Orissa, II., 158; Burma, I., 137; Mysore & Coorg, I., 48, 52; III., 7, 20; Agri.-Horti. Soc. Ind.:—Trans., VII., 57, 58; Jour., VI., 170; XI., 489; XIII., 311; New Series, II., 229; VI., 272, 273, 276; VII., 142, 277; Ind. Forester, I., 86, 88, 275; II., 19; III., 202, 366; IV., 227, 292, 322, 366; V., 93, 212, 497; VI., 101, 303; VIII., 103, 105, 106, 117, 118, 126, 127, 128, 131, 132, 271, 378, 388, 391, 414, 415, 416, 417, 438, 439, 440; IX., 215, 216, 519; X., 92, 222, 325, 326, 543, 545, 550, 551; XI., 355, XII., 19, 188, 258, 259, 260, xxii., 311, 313, 419, App., 13; XIII., 121, 127, 139; XIV., 147, 151, 159, 199, 390.*

Habitat—A large, deciduous tree, which attains a height of 80 to 100 feet, common throughout the moister regions of India. In the Siwalik tract and outer Himálayan valleys it extends west as far as the Rávi, and in places ascends to 4,000 feet. In Western India its limit appears to be in the forests south-west of Neemuch, where several places (Sadri, Bara Sadri, Chota Sadri) seem to have derived their names from it. It is also found on the western edge of the Malwa table-land, east of the Bunass river (Bassi forests). East and south of these points it extends throughout Central, Eastern, Southern India, and Burma. The tree thrives best in heavy binding soil, flowers in April, and the fruits ripen in February to April of the ensuing year. It coppices fairly well and bears long-continued pollarding. It does not generally lose its leaves until February, March or April, but is one

af. In Burma it
Western Penin-
ing the average

Ext... is tree sent to the Panjáb GUM 362
piec... d gum, black outside the
ed c... Berar in 1873 is in round-
glutinated and capable of

Mr. Campbell, in his recent *Notes on the Economic Products of Chutia*
gum to that above
nt gum," he writes,
most colourless, but

Dye and Tan.—The BARK is used occasionally, but very rarely, as a DYE & TAN. Bark. 363

red dye, said to be a favourite with Native tanners, who employ it to pro-
duce th
(*McCa*
nets.
to obtai
contain 16·7 per cent. of tannin, and to have a moderate amount of brownish-red colouring matter, quite sufficient to bring it into use if it could be obtained at a cheap rate. With salts of iron it gave a brownish-
black colour.
largely emplo
ning liquor, c
nalia Arjuna, T
Roxburghiana
mixed with cl
Cæsalpinia dig
minalia beleric
steeping in a
Lagerstrœmia parviflora (*McCann*). The FRUIT, like those of most other Fruit. 364
ry much inferior in
It is consequently
as a tannin agent.
xamined by Dr. Paul
were found to contain, respectively, 5·97 and 4 per cent. of gallo-tannic acid. The money value, compared with ground myrobalans at 7*s*. 6*d*. per cwt., was estimated by the latter chemist at 1*s*

MEDICINE.

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alluded to it.

Food and Fodder —The ASHES of the BARK are largely eaten by Natives as a substitute for lime with betel-leaf or *pán*. The LEAVES are lopped for cattle-fodder in the North-West Provinces and Oudh; the common *tasar* silkworm feeds on them. (*Brandis*). (Conf. with Silk Vol. II, Pt III.) — FOOD. Ashs. 367; Bark. 368; FODDER. Leaves 369

Structure of the Wood.—Sapwood reddish-white, heartwood dark-brown, hard, beautifully variegated with streaks of darker colour, shewing on a radial section as dark streaks, generally wavy or undulating. It seasons well and takes a good polish The weight has been given by various writers at from 50 to 71lb per cubic foot, the value of P. from 675 to 1230 (the strongest being from Burma). The durability of the timber is uncertain; in Burma the heartwood decays rapidly, in Northern India beams are sometimes found to last well, at other times to perish from dry rot or the attacks of insects. It is largely used for house-building, furniture, carts, shafts and wheels, agricultural implements, ship and boat-building, and for making rice-pounders It has also been tried for railway sleepers with fairly good results. Five sleepers laid down on the Oudh and Rohilkhand Railway in 1870 were reported in 1875 to be in a state — TIMBER. 370

Domestic.—The BARK is said by Lisboa to be used by the *Bhils* for poisoning fish. — DOMESTIC. Bark. 371

Terra japonica, see Uncaria Gambier *Roxb*, below, p. 210.

TETRAMELES, *R. Br.; Gen. Pl., I., 845.*

[*Ic., t. 1956;* DATISCACEÆ

Tetrameles nudiflora, *R. Br.; Fl. Br. Ind, II., 657; Wight,* 372

Syn —T. GRAHAMIANA, *Wight;* T. RUFINERVIS, *Miq.;* ANICTOCLEA GRAHAMIANA, *Nimmo.*

Vern.—*Sandugasa*, BENG.; *Payomko*, LEPCHA, *Bolong*, GARO, *Mainakat*, NEPAL; *Jungli-bendi*, BOMB.; *Bolur, jermála*, KAN; *Ugada*, MAR.; *Thitpouk*, BURM.; *Tseikpoban*, MAGH.

References ... 535; *Beddon* ... *rees,* *etc., of* ... *Pl.* *Bomb.,*

Habitat.—A ... 150 feet, found in Sikkim at 2,000 feet altitude, the western Gháts, from Bombay to Ceylon, Burma, Tenasserim, and the Andamans

Structure of the Wood.—White, very light, soft. It may be found useful for tea-boxes (*Gamble*). — TIMBER. 373

Tetranthera, *Jacq.;* see Litsea, *Lamk*, LAURINEÆ; Vol V., 81-85

TEUCRIUM, *Linn.; Gen. Pl., II, 1221.*

Teucrium Chamædrys, *Linn.; DC., Prodr. XII., 587,* LABIATÆ 374

THE WALL GERMANDER.

References.—*O'Shaughnessy, Beng. Dispens, 488; Irvine, Mat. Med. Patna, 112; Birdwood, Bomb. Prod, 63; S. Arjun, Bomb. Drugs, 181.*

Habitat.—A native of Europe and certain parts of Asia, imported into India for medicinal purposes.

MEDICINE. 375 Medicine.—This is one of the ingredients of the celebrated *Triak faruk* of the bazárs, which is the representative of the *Mithridatum, Theriaca Andromachi*, or *T. Damocratis* of the ancients. Originally it consisted of but a few drugs, now it is said to contain as many as sixty-one, including opium. It is in fact, an aromatic opiate, a drachm of which is equal to one grain of opium (*Birdwood*). The little canisters found in the bazárs are said by Waring to be wrapped in paper on which is printed in Persian, "The *Theriakh of Andromachi*, an invention of Theron the Presbyter. It is prepared, measured, and made public by one John Baptist Sylvesticus in the Rialto by authority of the excellent Government Physicians of ancient Righteousness, and of the Council of Apothecaries and learned Physicians, etc."

THALICTRUM, *Linn.; Gen. Pl., I, 4.*

376 **Thalictrum folio'osum,** *DC.; Fl. Br. Ind., I., 14;* RANUNCULACEÆ.

Vern.—*Pinjari, shuprak* (root = *pili-jari.*) HIND.; *Pila jari, pengla, jari, barmat*, root = *mamira*, KUMAON; *Gurbiani, pashmaran, phaliuri, chitra mul, keraita, chera, ? chireta, chitra*, (root = *piljari mamira*, PB.; *Chaitra*, KASHMIR; *Mamiran*, BOMB.

References.—*Stewart, Pb. Pl., 5; Pharm. Ind., 5; O'Shaughnessy, Beng. Dispens., 160; Flück. & Hanb., Pharmacog., 5; Dymock, Mat. Med. W. Ind., 2nd Ed., 20; Dymock, Warden & Hooper, Pharmacog. Ind., I, 33; Baden Powell, Pb. Pr., 324; Atkinson, Him. Dist., 751; Drury, U. Pl., 421; Gazetteers:—Mysore & Coorg, I., 57; Simla, 12; Agri.-Horti. Soc., Ind., Trans., VII., Journ. (Old Series), XIII., 359.*

Habitat.—An erect, rigid perennial herb, found in the Temperate Himálaya from 5,000 to 8,000 feet, and in the Khasia Hills between 4,000 and 6,000 feet.

MEDICINE. Root. 377 Medicine.—Two centuries ago Bernier mentioned "*mamiran*, a little ROOT good for the eyes, as being brought (along with rhubarb, musk, and the wood of China) from Cathay to Kashmir by a long journey" in which *jhúlas* are described as being crossed (*Stewart*). This *mamiran* is doubtless the root of the species under consideration, which is largely used as an *anjan* or application for ophthalmia in Afghánistán and throughout India to this day. (*Conf. with* Coptis Teeta *Vol. II, 521—526*). It is also considered a valuable antiperiodic and tonic in Native Materia Medica, and in the Panjáb is believed, in addition, to be purgative and diuretic (*Baden Powell*). Some fifty years ago specimens received from the Botanic Gardens, Saharunpur, were examined by Sir W. O'Shaughnessy, who describes his experiments with it as follows: "The bruised root having been given to large dogs in the quantity of 10 grs. to ʒii no particular effects were observed. It has been used in the Hospital of the Medical College in several cases of ague, and as a tonic in convalescence from acute diseases. Five grains of the powder or two grains of the watery extract, given thrice daily, have in some cases prevented, and in several moderated, the accession of fever, and at the same time acted gently on the bowels. The only sensation experienced was warmth at the epigastrium, and a general comfortable feeling." "It deserves extensive trial, and promises to succeed well as a febrifuge of some power, and a tonic aperient of peculiar value. Dose of the powder 5 to 10 grs. as a tonic and aperient, in the interval of intermittent fevers, and in convalescence from acute diseases."

On the compilation of the *Pharmacopœia of India* the plant was included in the secondary list, but since that time has attracted little atten-

tion. The authors of the *Pharmacographia Indica*, however, inform us that the root has recently been used with very satisfactory results in Bom- MEDICINE.

the Panjab Himalaya and Kumáon.

CHEMICAL COMPOSITION.—"Thalectrum root contains a large quantity of *berberine*, so combined as to be readily soluble in water" (*Pharmacog Ind.*). Chemistry. 378

THAMNOCALAMUS, *Munro; Gen. Pl., III.*

[GRAMINEÆ.

Thamnocalamus spathiflorus, *Munro; Brandis, For. Fl., 563.* 379

Vern.—*Ringall*, JAUNSAR, *Purmiok*, LEPCHA; *Myoosay*, BHUTIA

27; nd

ind

ro- FIBRE. 380

THEA.

Thea assamica, *Masters;* **T. sinensis**, *Linn.;* **T. bohea**, and **T. viridis**, see Camellia theifera, *Griff.*, TERNSTRŒMIACEÆ; Vol. II., 70; also the article TEA, Vol. VI, Pt. III 381

THEOBROMA, *Linn.; Gen. Pl., I., 225.*

Theobroma Cacao, *Linn.;* STERCULIACEÆ. 382

bas
saic
par
duc
Cey
five or six years old.

OIL.—A light yellowish, opaque, solid oil, known as "Cacao butter," is prepared for use in pharmacy, by pressing the warmed SEEDS. These, oil. Cacao butter is dry at touch is brittle enough to a dull waxy fracture. It the mouth with a bland and fuses at 20° to 30° C. OIL. Seeds. 383

sts of several substances fatty acids. The chief in- CHEMISTRY. 384

CHEMISTRY. gredients are *stearic*, *palmitic*, and another compound of glycerin containing probably an acid of the same series richer in carbon—perhaps *arachic acid*, C_{20} H_{40} O_2, or *theobromic acid*, C_{64} H_{128} O_2. A small quantity of *oleic acid* is also present.

MEDICINE. Cacao-Butter. 385 **Medicine.**—CACAO-BUTTER possesses the valuable property of not becoming rancid from exposure, and it was introduced into European medicine, chiefly owing to this quality, for pharmaceutical purposes. It is officinal in the Pharmacopœias of India, and of the United Kingdom, and is now chiefly employed in the manufacture of suppositories, medicated pessaries, etc.

FOOD. Seeds. 386 **Food.**—The tree bears a pod-like fruit, 6 to 10 inches long, and 3 to 5 in girth, which contains fifty or more seeds. These seeds dried and ground form the cocoa nibs of commerce, from which cocoa extracts and chocolate are prepared. These seeds were first brought to the notice of Europeans in 1513-1525, by the Spanish invaders of America, who found them current among the Yucatan, instead of money. Their value as a food-product was described by Benzoni about 1550 (*Pharmacographia*). The first notice of their having been brought to England occurs in 1657, from which date the popularity of chocolate as a beverage and confection has gradually increased, till, in 1880, the quantity entered for consumption in Great Britain amounted to over 10,000,000lb. As already stated, the tree has been introduced into India and is now cultivated to some extent. On the Malabar coast it is grown by the Roman Catholic missionaries, who make small quantities of cocoa regularly, for their own use and for local sale to Europeans. In Ceylon the cultivation has acquired considerable proportions, and the produce is said to be highly valued in the home-market.

The following account of the method of preparing the fruit as pursued in that Island may be quoted in full from the *Tropical Agriculturist*:—

"A coolie picks two bushels of cocoa beans per diem, and as five bushels wet are equal to 1 cwt. dry, the cost is only about 87 cents per cwt. for picking, as compared with R2 to R3 for Liberian-coffee. The pods are first cut from the tree, a small piece of stem being left on the tree; the coolie takes one in each hand and with a knock breaks them both in halves, and then with one draw of his fingers dexterously strips all the beans off the centre pulp. The pods are then thrown down round the trees and act as manure, while the beans are removed to the fermenting cisterns. It takes from five to nine days to properly ferment the cocoa, and it is then ready for working. It is trampled first, as in coffee, with the feet, and then removed in baskets and carefully hand-washed, as washing with the *mammotty* damages the beans. I have no doubt that ere long some means less expensive will be found for washing, and the "Clerihew" will be much improved on too.

"After washing" the cocoa is laid on mats to dry, as coffee is, if the weather be suitable; and at times it is advisable to give it a rub-over with small pieces of sack or cloth, which improves the appearance of the beans, and facilitates drying in showery weather. The difference in well-cured and badly-cured cocoa amounts to at least R20 per cwt., and the prices obtained for it, as in tea, will depend in a much greater measure on the careful attention of the curing than in the case of coffee."

A tree in full bearing is said to yield about 150lb of seed annually. It favours hot, moist climates, and the young plants must be shaded and well watered. There would appear to be no reason why it should not be cultivated very successfully in the hotter and moister parts of Southern India. The dried seeds, roasted and ground, constitute the cocoa of commerce; chocolate is prepared by still finer grinding so as to

make a perfectly fine powder, after which it is flavoured (generally with vanilla) and moulded while hot. The nutritive and sustaining powers of cocoa and chocolate are too well known to require further detail. FOOD.

THESPESIA, *Carr.; Gen. Pl, I., 208.*

[*Ic, t. 5;* MALVACEÆ.

Thespesia Lampas, *Dalz. & Gibs.; Fl. Br. Ind., I., 345; Wight,* 387

Syn.—HIBISCUS LAMPAS, *Cav.;* H. TETRALOCULARIS & GANGETICUS, *Roxb.*, PARITIUM GANGETICUM, *Don.*

Vern.—*Bankapas,* BENG.; *Bon kapsi,* SANTAL; *Bonkapash,* ASSAM; *Rán-bhendi,* MAHR.; *Adavi pratti, conda patti, rondapatti,* TEL.

FIBRE. Twigs. 388

MEDICINE. Root. 389

Fruit. 390

TIMBER. 391

T. populnea, *Corr.; Fl. Br. Ind, I., 345; Wight, Ic., t. 8.* 392

THE PORTIA TREE: the UMBRELLA TREE: or TULIP TREE of [Indian writers.

Syn.—HIBISCUS POPULNEUS, *Linn.;* H. POPULNEOIDES, *Roxb.;* MALVA-

285; III. 23, XV., 78, Burma, I, 139; Agri.-Horti. Soc, Ind.: Journal (Old Series), IX., 400; Ind. Forester, III, 200; VI., 239, 321; X, 29; XI., 328.

THESPESIA populnea.

Properties and Uses of the Tulip Tree.

Habitat.—A moderate-sized evergreen tree, found in the Coast forests of India, Burma, the Andaman Islands, and Ceylon; largely cultivated along roadsides, especially in Madras.

GUM. 393 **Gum.**—It is said to yield a GUM, which was sent from Madras to the Panjáb Exhibition, but which may probably have been the yellow milk of the capsules, dried.

DYE. Capsules. 394 Flowers. 395 Bark. 396 **Dye.**—The CAPSULES and the FLOWERS are said to give a yellow dye, which is apparently little used. Liotard states that the former are not articles of ordinary traffic, and that nothing is known of the process of dyeing with them. McCann states that the BARK of a tree called *páras* is employed in Mánbhúm with the bark of Terminalia tomentosa to produce a favourite red dye. He suggests that this may be the bark of Thespesia populnea since it cannot be that of the other *páras*, Butea frondosa.

The dried capsules and calyces were found by Mr. Wardle to contain a small amount of yellow colouring matter soluble in water, and capable of producing, by the aid of suitable processes, artistic though somewhat faint shades of brownish-yellow and light brown, on tasar and mulberry silk and wool. "This," he remarks, "would be a useful dye-stuff, but the fact of its containing so small an amount of colouring matter would be rather against it."

FIBRE. Bark. 397 **Fibre.**—The BARK yields a strong fibre, rarely employed in India except in the rough state, for tying bundles of wood, etc. In Burma it is said to be used for cordage (*Gazetteer, I., 139*). It is said to be used in Demerara for making coffee bags.

OIL. 398 **Oil.**—It yields a deep, red-coloured, and somewhat thick OIL—*huile amore*—the value of which is as yet unknown to the Natives, but which might be employed medicinally in cutaneous affections. Its expense precludes its use for other purposes.

MEDICINE. Heart-Wood. 399 Juice. 400 Fruit. 401 Bark. 402 Seeds. 403 Flowers. 404 Roots. 405 Leaves. 406 **Medicine.**—Rumphius speaks highly of the value of the HEART-WOOD as a remedy for bilious attacks and colic, and in a kind of pleurodynia from which the Malays often suffer. Ainslie states that the yellow JUICE of the FRUIT is employed as an external application in various cutaneous affections, particularly in 'Malabar itch,' that a decoction of the BARK is used as a wash in the same complaints, and that the same preparation is given internally by the *Vytians* as an alterative, in doses of three or four ounces twice daily. Waring included the plant in the secondary list of the *Pharmacopœia of India*, where he states that he had made several trials with the juice of the fruit In some cases it exercised a favourable influence, but in the majority it was productive of little or no benefit. Irvine remarks that in Patna the SEEDS are "used in horse-medicines and in purges;" in the *Report on the Settlement of the Chanda District* it is stated that the ROOT is taken as a tonic; the FLOWERS are said to be employed in the Konkan in the cure of itch, and Dymock informs us that the LEAVES are employed as a local application to inflamed and swollen joints.

Chemistry. 407 **Chemical Composition.**—The heart-wood, recommended by Rumphius, and apparently neglected by all writers since his time, has been examined by the authors of the *Pharmacographia Indica* These chemists find that it contains a garnet-red resin which can be easily separated by digesting the wood in diluted alkali and using hydrochloric acid to precipitate it from the filtered solution. It is insoluble in water, but perfectly soluble in alcohol, chloroform, and the alkalies.

Special Opinions.—§ "The fresh leaves smeared with some bland oil, and applied hot over inflamed parts, form a soothing and valuable substitute for ordinary poultices" (*Surgeon-Major E. H. Levinge, Rajahmundry, Madras*). "The juice of the fruit is used as an application

for ring-worm; the leaves, heated and smeared with warm oil, make an excellent poultice I used them largely at Bellary during the famine, with great success, as an application to the sores and abscesses caused by guinea-worm" (*Surgeon-Major Lionel Beech, Coconada*). MEDICINE

Structure of the Wood.—Sapwood soft, pale reddish to brown, with small dark-coloured, hard heart-wood; weight 50lb per cubic foot. It is strong, even-grained, and durable, and is used in South India for making gun-stocks, carts, carriages, and furniture, in Burma for carts, wheel-spokes, furniture, and purposes of carpentery generally' It is said to have been much utilised at one time by the Ordnance Department for gun-carriages. TIMBER. 408

Domestic and Sacred.—The Tulip Tree is largely planted in Southern India and Bengal in gardens and along road-sides to give shade The LEAVES are employed by Hindus in the religious ceremonies attending death. DOMESTIC & SACRED. Leaves 409

THEVETIA, *Linn.; Gen. Pl., II., 699*

Thevetia neriifolia, *Juss.; Kurz, For. Fl. Burm., II., 168;* 410

THE EXILE OR YELLOW OLEANDER. [APOCYNACEÆ.

Syn.—CERBERA THEVETIA, *Linn.*

Ve

NOTE.—The vernacular names given to this plant, in most languages of India mean "the yellow Nerium odorum" *Ed.*

Hal

almost naturalised in Bengal, and common everywhere, scarcely a garden in the plains of India being without a few bushes, if not a hedge, of this

...ned from the SEEDS. It burns ... medicinal value, and from Dr ... refully prepared, to be not only OIL. Seeds. 411

per cent tripalmitin and tristearin. After expression of the oil De Vry obtained from the cake about 4 per cent. of a beautiful crystallised white

MEDICINE. Juice. 412 Bark. 413

Medicine.—The milky JUICE of the tree is highly poisonous. Its bitter and cathartic BARK is said to be a powerful febrifuge, the antiperiodic properties of which, first noticed by M. Descourtilz, have been confirmed

MEDICINE. Kernels. 414 by Dr. G. Bidie and Dr. J. Shortt. It was tried in the form of a tincture in various kinds of intermittent fever, with highly satisfactory results. In large doses it acts as an acrid purgative and emetic, and in still larger doses as a powerful poison. The KERNELS are very bitter, and when chewed produce a slight feeling of numbness and heat in the tongue. The oil extracted from them is said to be emetic and purgative, indeed, according to Dr. Shortt, it produces violent vomiting and hypercatharsis (*Pharm. Ind.*). As already stated, however, Dr. Warden found the pure oil to be inert. The kernel is a powerful acro-narcotic poison, its property residing in a highly toxic principle (*thevetin*), which has been separated by Dr. Warden (*Conf.* para. on Oil, *above*). A case of poisoning by one of these kernels is recorded by Dr. J. Balfour (*Madras Jour. of Lit. and Science*, 1857, *Vol. III., N. S.*, 120). "Recovery ensued; but, from the symptoms detailed, they belong evidently to the class of acro-narcotic poisons. In all trials with this remedy, much caution is necessary." (*Pharm. Ind.*)

Thistle, see Carduus nutans, *Linn.*; COMPOSITÆ; Vol. II., 156.

Thitsi, see Melanorrhœa usitata, *Wall.*; Vol. V., 208.

Thorn-Apple, see Datura Stramonium, *Linn.*; SOLANACEÆ; Vol. III., 40.

THYMUS, *Linn.*; *Gen. Pl.*, *II.*, 1196.

415 A genus which contains about fifty species, natives of North Temperate regions. Of these only one is indigenous in India. A small dried Thyme of undetermined species is imported as a drug into Bombay from Persia. It is known as *mishk-i-taramashia*, *sathin*, and *rang*, has a pleasant odour like peppermint but sweeter, and is stimulant and carminative in properties (*Dymock*, *Mat. Med. W. Ind.*, 2nd Ed., 713). [This, I very much doubt being a species of Thymus. *Ed. Dict. Econ. Prod.*]. The medicinal oil of T. vulgaris, *Linn.* (*Bentley & Trimen*, *Med. Pl.*, t. 205), is employed in European practice in India, but is not known to the Natives.

416 **Thymus serpyllum**, *Linn.*; *Fl. Br. Ind.*, *IV.*, 649; LABIATÆ.

Syn.—T. LINNÆANUS, *Benth.*

Vern.—*Masho*, *ran sohar*, *marizha*, *shukri*, *kalamdar sutar*, PB.; *Ban-ajwain*, N.-W. P.

References.—*Stewart*, *Pb. Pl.*, 173; *O'Shaughnessy*, *Beng. Dispens.*, 491; *Year-Book Pharm.*, 1874, 625; *Agri.-Horti. Soc. Ind.*—*Trans.*, *III.*, 199; *Journ.* (*Old Series*), *IV.*, *Sel.*, 119.

Habitat.—A small, aromatic shrub, common in the Western Temperate Himálaya from Kashmir to Kumáon, from 5,000 to 13,000 feet, and in Western Tibet, between 10,000 and 15,000 feet.

MEDICINE. Medicine.—"On the Chenáb the SEEDS are given as a warm medicine, Seeds. 417 and Honigberger states that the plant is officinal in diseases of the eyes and stomach" (*Stewart*).

FOOD. 418 Food.—The LEAVES and TWIGS are employed as a flavouring agent in Leaves. 419 Kumáon (*Atkinson*).

Twigs. 420

THYSANOLÆNA, *Nees*; *Gen. Pl.*, *III.*, 1120.

[GRAMINEÆ.

Thysanolæna acarifera, *Nees*; *Duthie*, *Fodder Grasses N. India.*

Syn.—AGROSTIS MAXIMA, *Roxb.*

Vern.—*Kersar*, SANTAL.

References.—*Roxb.*, *Fl. Ind.*, *Ed. C.B.C.*, 107; *Rev. A. Campbell*, *Rep. Econ. Pl. Chutia Nagpur*, *No.* 8178; *Ind. Forester*, *XI.*, 233.

Habitat.—A tall, handsome grass, with minute spikelets, native of Tropical Asia. It is not uncommon on the plains, and at low elevations on the hills, generally occurring in the vicinity of water.

Medicine.—A decoction of the ROOT is used in Chutia Nagpur as a mouthwash during fever (*Campbell*). MEDICINE. Root. 421

[GINEÆ; Vol. IV, 214.

Tiaridium indicum, *Lehm.*, see Heliotropium indicum, *Linn.*; BORA-

[317

Tiger Grass, see Nannorhops Ritchieana, *H. Wendl.*; PALMÆ; Vol. V.

[In different parts of India various plants bear this name. By sportsmen, the one above all others that might be so designated would very probably be the spear-grass—Heteropogon contortus, see Vol. IV, 227.—*Ed., Dict. Econ. Prod.*]

TIGERS, CATS, AND CIVETS. 422

superior in size to itself (*Blanford*).

[(*Mammila*), 53-100.

Tigers, Leopards, Cats and Civets, *Blanford, Fauna Br. Ind.*, 423

work, in alphabetical order.

I.—FAMILY FELIDÆ.

1. Cynælurus jubatus, *Blyth; Blanford, Mam. Ind.*, 91.

THE HUNTING LEOPARD, or CHEETAH of Anglo-Indian writers SPECIES The Cheetah. 424

TIGERS, CATS, Civets.

Species of the Cat Family.

SPECIES.

Leopard-Cat. 425

2. Felis bengalensis, *Kerr; Blanford, Mam. Ind.*, 78.
THE LEOPARD-CAT.
Vern.—*Chita billa*, HIND.; *Ban biral*, BENG.; *Wagati*, MAR.; *Rimau-akar*, MALAY.; *Kye-thit, thit-kyuk, kya-gyak*, BURM.; *Kyoung*, ARAKAN; *Kla-hla*, TALAIN, KAREN.
Habitat.—Common in the Himálaya as far west as Simla, in Lower Bengal, Assam, the Burmese and Malayan countries, Southern China, Sumatra, Java, Borneo, and the Phillipines. It is also found in the Syahádri Range or Western Gháts, Coorg, Wynaad, Travancore, and in some of, perhaps all, the other forest regions of the peninsula, though not very abundantly.

Caracal. 426

3. F. caracal, *Güldenstädt; Blanford, Mam. Ind.*, 88.
THE CARACAL.
Vern.—*Siyah-gush* (black ears), PERS. & HIND.; *Tsogde*, LITTLE TIBET; *Ech*, LADAK.
Habitat.—Found in the Panjáb, Sind, North-Western and Central India, and in the greater part of the Peninsula, except the Malabar coast, but rare everywhere. Ball met with it in Chutia Nagpur.

Jungle Cat. 427

4. F. chaus, *Güldenstädt; Blanford, Mam. Ind.*, 86.
THE JUNGLE CAT.
Vern.—*Jangli-billi, khatás*, HIND.; *Khatás, banberál*, BENG.; *Berka*, HILL TRIBES OF RAJMAHAL; *Bául, bhároga*, MAR.; *Mant-bek*, KAN.; *Kada-bek, bella bek*, WADARI; *Katu-punai*, TAM.; *Jurka pilli*, TEL.; *Cherru puli*, MALAY.; *Kyoung tset-kun*, ARAKAN.
Habitat.—The common wild cat of India from the Himálaya to Cape Comorin, and from the level of the sea to 7,000 or 8,000 feet or perhaps higher on the Himálaya. It is also found in Ceylon and extends east to Burma.

Lion. 428

5. F. leo, *Linn.; Blanford, Mam. Ind.*, 56.
THE LION.
Vern.—*Sher, babar-sher, singh*, HIND.; *Shingal*, BENG.; *Süh* or *suh*, ♂, *siming* ♀, KASHMIR; *Rastar*, BRAHUI; *Untia-bagh* (camel-tiger), GUZ.; *Sawach*, KATHIAWAR.
Habitat.—About twenty years ago the lion was common near Mount Abú; several were shot near Gwalior, Goona, and Kota, and a few still existed near Lalitpur, between Saugor and Jhansi. In the early part of the century, it was common near Ahmedabad, and was found in Hurriana to the north-west, in Khándesh to the south, in many places in Rájputána, and eastward as far as Rewah and Palamow. Indeed, it was probably at one time generally distributed in North-Western and Central India. Now-a-days, however, it is verging on extinction, but there are probably a very few still living in the wild tract known as the Gir, in Kathiawar, and a few more in the wildest parts of Rájputána, especially Southern Jodhpur, Udaipur, and around Mount Abú.

Lynx. 429

6. F. lynx, *Linn.; Blanford, Mam. Ind.*, 89.
THE LYNX.
Vern.—*Gy*, TIBET; *Patsalan*, KASHMIR.
Habitat.—Found in the Upper Indus valley, Gilgit, Ladák, Tibet, etc.; also throughout Asia, north of the Himálaya, and Europe, north of the Alps.

Pallas's Cat. 430

7. F. manul, *Pallas; Blanford, Mam. Ind.*, 83.
PALLAS'S CAT.
Habitat.—Found in Tibet, extending into Ladák. It has not been observed on the south side of the main Himálayan range, but is found to the north as far as Siberia, and is common in Mongolia.

8. Felis marmorata, *Martin; Blanford, Mam Ind.,* 74. SPECIES

THE MARBLED CAT. Marbled Cat. 431

... stern Himálaya, and in the hill ... Ialay countries, extending to Sur...

9. ... Clouded Leopard. 432

... LAY ... etc., at ... also met with in the Assam hills, and throughout the hilly parts of Burma, Siam, the Malay Peninsula, Sumatra, Java, and Borneo.

... Desert Cat. 433

... and Hurriana.

11. ... Leopard or Panther 434

... HIND.; *Teon-kula,* ... *lag,* GOND; *Sonora,* ... *kam-kei,* KUKI; ... *Kajengla,* MANI... *tahir hé, goral-hé,* ... ere for the hyæna), ... R; *Diho,* BALUCH, ... *bibia-bagh,* MAR., ... KAN.; *Chiru-thai,* SINGAL.; *kya-lak,* ... BURM.; *Klapreung,* TALAIN; *Kiché-phong,* KAREN; *Rimau-bintang,* MALAY; *Palang,* PERS.

... ception of ... In India, ... Sind and ... the panther, and the pard as distinct species, but Jerdon, Blyth, etc., agree in considering all to be merely varieties of one species.

12. F. rubiginosa, *I. G. Bélanger, Blanford, Mam. Ind.,* 81. Rusty spotted Cat. 435

THE RUSTY-SPOTTED CAT.

Vern.—*Namali* ...

... in C... Provinces.

13. F. temmincki, *Vigors & Horsf.; Blanford, Mam. Ind.,* 75.

THE GOLDEN CAT. Golden Cat. 436

Habitat.—Occurs in the South-Eastern Himálaya at a moderate elevation; rare in Nepál, more abundant in Sikkim, found also in Tenasserim, Sumatra, and Borneo, and probably throughout Burma and the Malay Peninsula.

14. F. tigris, *Linn.; Blanford, Mam. Ind.,* 58. Tiger 437

THE TIGER.

SPECIES.

Tiger.

Vern.—*Bágh, sher* (female=*bághni, sherni*), *náhar, sela vágh*, HIND.; *Go-vágh*, BENG.; *Tut, sad*, HILL-TRIBES OF RAJMEHAL; *Garúm kúla*, KOL.; *Kula*, SANTAL, HO, & KURKU; *Lákhra*, URAON; *Krodi*, KHOND; *Túkt, tuk*, BHOT; *Sathong*, LEPCHA; *Keh-va*, LIMBU; *Sehi*, AKA; *Matsá*, GARO; *Kla*, KHASI; *Sa, ragdi, tekhu, khudi*, NAGA; *Humppi*, KUKI; *Sumyo*, ABOR; *Su*, KHAMTI; *Sirong*, SINGPHO; *Kei*, MANIPURI; *Misi*, CACHARI; *Tág*, TIBET; *Padar-suh*, KASHMIR; *Shinh*, SIND; *Masar*, BALUCH.; *Patayat-bágh, waház*, MAR.; *Púli*, TAM., TEL., MALAYL., & GOND; *Púli redda-púli, peram-pilli*, TAM.; *Pedda-púli*, TEL.; *Perain-púli, kúdua*, MALAYL.; *Kuli*, KAN.; *Nari*, COORG; *Pirri, bursh*, TODA; *Kya*, BURM.; *Kla*, TALAIN.; *Khi, botha-o, tupuli*, KAREN; *Htso*, SHAN; *Rimau, harimau*, MALAY.

Habitat.—Found throughout India, Burma, and other parts of South-Eastern Asia, Java, and Sumatra, but not, it is said, Borneo. It occurs in suitable localities throughout a great part of Central Asia, and is found in the valley of the Amur, the Altai Mountains, around Lob Nor in Eastern Turkestan, about the Sea of Aral, on the Murgháb near Herat, on the southern coast of the Caspian (Hyrcania), and in the Caucasus, but not in Tibet, Afghánistán, Baluchistán, or Persia, south of the Elburz Mountains on the Caspian. In India it still occurs wherever large tracts of forest or grass jungle exist, but within the last twenty or thirty years the number of tigers has greatly diminished, and they are now becoming scarce, or have even, in some cases, disappeared entirely in localities where they were formerly common. This has been especially the case throughout a large area of the Central Provinces, in many parts of Bengal, and several districts of the Bombay Presidency. In the forests at the base of the Himálaya tigers are common, and they occasionally ascend the hills to an elevation of 6,000 to 7,000 feet, but none are found in the interior of the mountains.

Waved Cat. 438

15. **Felis torquata**, *F. Cuv.; Blanford, Mam. Ind.*, 85.

THE WAVED CAT.

Habitat.—This cat may be merely a descendant of the domestic cat which has run wild, but, according to Blanford, it is at least equally probable that it constitutes the original stock from which Indian domestic cats, and possibly those of other countries, are derived. It is probably widely dispersed through Northern India, since specimens have been obtained in Nepal, Kashmír, and Rájputána, but it does not appear to be common anywhere.

16. **F. uncia**, *Schreber; Blanford, Mam. Ind.*, 71.

THE OUNCE, OR SNOW LEOPARD.

Snow Leopard. 439

Vern.—*Ikar, zig, sachak, sáh*, TIBET; *Bharal he*, HILLS NORTH OF SIMLA; *Thurwágh*, KASHMIR.

Habitat.—High Central Asia, especially Tibet, extending north to the Altai, and west, it is said, into Persia. It is found throughout the Himálaya at high elevations, and is more abundant on the Tibetan side of the Snowy Range, where it is met with in the Upper Indus and Sutlej valleys. It is also fairly common in Gilgit.

17. **F. viverrina**, *Bennett; Blanford, Mam. Ind.*, 76.

THE FISHING CAT.

Vern.—*Banbiral, báráun, khupya-bágh, bágh-dásha*, HIND.; *Mach-bágral*, BENG.; *Handún-diva*, SING.

Fishing Cat. 440

Habitat.—Found in marshy thickets, swamps, and tidal creeks, which it affects owing to its fish-eating habits, in Bengal, probably Orissa, and the Indo-Gangetic plain generally, extending as far as Sind. It is unknown in the Peninsula of India except on the Malabar coast, where it occurs from Mangalore to Cape Comorin, but not, so far as is known, to the northward near Bombay. It also occurs in Ceylon. Along the base

of the Himálaya it is met with as far west as Nepal, and ranges throughout Burma, Southern China, and the Malay Peninsula. SPECIES.

II.—Family Viverridæ.

18. ... *Id.*, 96.

Large Indian Civet 441

...*dos, pudo ganla*, Beng.; ... *Kung*, Bhot.; *Saphsong*, ...rm., *Tangalong*, Malay;

...y Peninsula, Siam, and ...t from Bengal to Orissa ... further south and west, ...ending the Himálaya to

19. V civettina, *Blyth*, *Blanford, Mam Ind.*, 98.

Malabar Civet. 442

... with the above by ...s the area which it ...nd tract of country ... or Karnatik), it is ...verdon, it is found throughout the Malabar coast, from Honawar to Cape Comorin, but may possibly extend further north.

20. V.

Burmese Civet 443

Habitat—Burma, Malay Peninsula, Cochin China, and Sumatra; recorded from as far north as Prome.

21. Viverricula malaccencis. *Blyth*; *Blanford, Mam. Ind.*, 100.

The Small Indian Civet.

Small Indian Civet 444

Vern.—*Mashk-billa, katás, kasturi* (a name properly belonging to the musk-deer), Hind.; *Gandha gokal, gando gaula*, Beng.; *Sogol*, Ho Kol; *Saiyar, bág-myal*, Nepal Tarai; *Jowádi manjur*, Mar.; *Punagin bek*, Kan.; *Pánagú pilli*, Tel.; *Urulama*, Sing.; *Kaung-kado* ...

... civet and becomes perfectly tame. Several other species of the family Viverridæ exist, but the four above enumerated, especially the first and last, are the commonest sources of commercial civet; the others are not of sufficient economic interest to warrant giving an enumeration of them.

Peculiarities and Properties of the Indian Tiger, Cats and Civets.

Peculiarities Habits. 445

Habits.—All the members of the family Felidæ are distinguished by their purely carnivorous habits, by their strength, activity, and, in certain cases, by their ferocity. The smaller species are, perhaps, the fiercest and least tameable, especially F. bengalensis, F. chaus, F. lynx, and F. marmorata. Of the larger species, F. pardus, the leopard, is, by universal consent, admitted to be the most courageous, and, when brought to bay, the most dangerous, but it, as well as the tiger, is rarely formidable unless when it has taken to man-eating. When it does so, it often becomes an even more fearful scourge than a man-eating tiger. Thus Sterndale, and also Forsyth (*Highlands of Central India*) relate the history of

MAN-EATING TIGERS.

a leopard near Seoni which, in two years before it was shot, is said to have killed two hundred human beings. Leopards, when large, frequently kill cattle, poneys, donkeys, and large deer, such as *sambár*; but the smaller animals have to content themselves with inferior prey. Thus Blanford writes, "The leopard is absolutely without prejudice in the matter of food—all beasts, birds, and, I believe, reptiles, that are not too large to kill, or too small to catch, are the same to him: he will strike down an ox or bound upon a sparrow. If he has a predilection it is probably for dogs and jackals. He is a terrible foe to monkeys, and kills many of the *hanúmáns* or *langúrs* who inhabit the rocky hills in which he delights."

Great numbers of domestic animals are annually killed by tigers; indeed, many of the latter appear to live entirely upon cattle. Forsyth, in his interesting *Highlands of Central India*, states that tigers, as a rule, are entirely game-killers, during the more vigorous portion of their life; as they become older they grow more cunning, less afraid of man, and less able to find their prey amongst the swift big game, and naturally take to cattle-eating. From this stage many go on to that of the man-eater, "a tiger who has got very fat and heavy, or very old, or who has been disabled by a wound, or a tigress who has had to bring up young cubs where game is scarce,—all these take naturally to man, who is the easiest animal of all to kill, as soon as failure with other prey brings on the pangs of hunger" (*Forsyth*). Two classes are distinguished by the *shikáris* of the Central Provinces as *lodhia-bagh*, a game-eating tiger; *úntia-bagh*, a cattle-lifting tiger; a man-eater is generally an older and lighter coloured *úntia bágh*. A tiger that has once taken to man-eating, continues to live occasionally on the same prey, but, according to Blanford, it is the exception for even man-eaters to confine themselves to human food.

Tigresses with cubs are frequently very destructive to cattle, often quartering themselves in the neighbourhood of a village and feeding entirely on the herds within their reach. The tigress is said to be very destructive in such circumstances, partly in order to teach the young to kill their own prey; while the young tigers, according to Forsyth, appear to kill as many as they can among a herd, merely from wanton pleasure in the exercise of their developing strength. The destruction of such a dangerous animal has naturally been encouraged to the utmost by Government, which for many years has awarded sums varying from R5 to R50, according to the district, for every head killed. Notwithstanding these endeavours, coupled with the large extent to which both tigers and leopards are shot for sport by Englishmen throughout the country, the annual destruction of life is still very considerable.

The lion was at one time also very destructive, but for many years it has become so rare in India as to be hardly worthy of notice. It is said to feed chiefly on deer, antelopes, wild pigs, cattle, horses, donkeys, and camels, and used formerly to kill many of the latter (*Blanford*).

Almost all the other members of the tribe are very destructive to small game, and when in the neighbourhood of man, to sheep, goats, and poultry. In Tibet the lynx has the reputation of being extremely bloodthirsty and savage, a reputation which is more than confirmed by Scully's observation that a pair of them killed six sheep in one night near Gilgit. The leopard cat is said to be extremely destructive to poultry in South India; in Tibet and the inner Himálaya the ounce carries off sheep, goats, and dogs from villages, and even hill poneys, but, it is said, to have never been known to attack man. Two species, the hunting leopard or *chíta*, and the caracal, have long been employed in India to capture deer and other game. The former is always captured when mature, since, according to the native *shikári*, it never learns to kill properly when captured

T. 445

HUNTING LEOPARDS.

sport is a very favourite one with Native princes in India, and, according to Abul Fazl, was much patronised by the Emperor Akbar, in whose time the system of training these animals must have been carried to great perfection. Thus it is stated that they were always allowed to remain loose, They were which got a :aded saddle or Gushkani

The caracal, a much smaller animal, is trained to catch birds and small deer, gazelles, hares, or foxes. According to Blyth, a favourite sport in certain parts of the country is to pit these cats against each other to kill pigeons out of a flock. While the birds are feeding on the ground the caracals are let loose together, and each is said often to strike down

using the plucky little animal for hunting purposes. In former times it would attack a hare or a fox; but now it kills black deer. It eats 1 seer of meat daily. Each has a separate keeper, who gets 100 *dam* every month."

FUR. 440

Medicine.—The FLESH of the tiger and leopard are believed in many localities to be medicinal. That of the former is said by Ainslie to be

MEDICINE. Flesh. 447
Fat 448
Claws. 449
Rudimentary Clavicles 450
Whiskers 451

no special powers in these respects. Jerdon states that Viverricula malac-

MEDICINE. censis is frequently kept by Natives for the purpose of yielding the secretion, and Waring, in the *Pharmacopœia of India*, mentions an establishment at one time kept up at the expense of Government in which civets were specially reared.

FOOD. 452 **Food.**—The Santals, Burman, and Malays, and several other aboriginal tribes, eat the flesh of the tiger and believe that it conveys with it the courage and sagacity of the animal. In most cases they refuse to allow their women to eat it, probably because they consider them better without any high development of these characters.

DOMESTIC & SACRED. **Domestic and Sacred.**—Tigers or representations of them are objects of adoration or propitiation amongst the aboriginal tribes of Central India, and many of the less enlightened hill people of the Himálaya. They

Clavicles. 453 consider the CLAVICLES and CLAWS to be powerful charms; in certain lo-

Claws. 454 calities the WHISKERS are supposed to be a deadly poison, and are carefully burned off as soon as the animal is killed; in others they are believed to

Whiskers. 455 endow the possessor with unlimited powers over the opposite sex. Amongst the Santals the most solemn oath is on a tiger's skin, a circumstance which is, or at one time was, taken advantage of in the Courts of Justice. The claws are frequently mounted in silver or gold as bracelets, armlets, etc.

TILIACORA, *Coleb.; Gen. Pl., I., 36.*

456 **Tiliacora racemosa,** *Coleb.; Fl. Br. Ind., I., 99;* MENISPERMACEÆ.

Syn.—T. FRATERNARIA, CUSPIDIFORMIS, ABNORMALIS & ACUMINATA, *Miers.;* MENISPERMUM ACUMINATUM & RADIATUM, *Lamk.;* M. POLYCARPUM, *Roxb.;* COCCULUS ACUMINATUS, *DC.;* C. RADIATUS, *DC.;* C. POLYCARPUS, *Wall.*

Vern.—*Karwanth, karrauth, rangoe, baga mushada,* HIND.; *Tiliakora, tiliakoru,* BENG.; *Tiga mushadi, tige mushidi, tige mushini, tige, tiva mushidi, naga mushini, pitéru, pita veru, kappa tige,* TEL.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 733; Kurz, For. Fl. Burm., I., 54; Brandis, For. Fl., 10; Gamble, Man. Timb., 11; Elliot, Fl. Andhr., 53, 122, 146, 181, 182; O'Shaughnessy, Beng. Dispens., 202; Dymock, Warden, & Hooper, Pharmacog. Ind., I. 64; Gazetteers:—Mysore & Coorg, I., 56; N.-W. P., IV., lxvii.; Agri.-Horti. Soc. Ind., Journ. (Old Series), V., Sel., 65; VI., 5.*

Habitat.—A large, climbing shrub, found throughout Tropical India, from Bengal and Oudh to Orissa, the Konkán, Ceylon, and Singapur.

MEDICINE. Root. 457 **Medicine.**—Roxburgh informs us that the ROOT, rubbed between stones and mixed with water, is given as a drink for the cure of venomous snake-bites, though the Natives confess that they have little belief in its virtues. Three kinds of *mushadi* are believed to be antidotes of this kind, by the Telingás, *viz.*, *mushade*, **Strychnos Nux vomica**; *naga-mushadi*, **Strychnos colubrina**, and *tiga mushadi*, the plant now under consideration. The writers of the *Pharmacographia Indica* remark, "It is bitter like others of the genus" (?—Natural Order,—there is only one species of Tiliacora), "and it is hardly necessary to say, no antidote to snake-poison."

DOMESTIC Branches. 458 **Domestic.**—The long flexible BRANCHES are used for thatching and basket-work (*Brandis*).

TIMBERS.

459 **Timber Trees of India.**

The quality of wood obtai[illegible] m all the important timber trees of India, has, as the reader m[illegible] served, been treated of in paragraphs under each species, [illegible] ure of the Wood. It was proposed to give here a collecti[illegible] h all t[illegible] f any importance would have been enumer[illegible] hicl[illegible] served as a key to the descriptive accou[illegible] gh[illegible] ary, and would also have proved of valu[illegible] i[illegible] s, but

TIMBER.

the wood is derived—see Agricultural Implements, Vol I, 145; Boat & Ship-building, Vol. I., 460; Bows & Arrows, Vol. I., 518, Boxwood, Substitutes for —, Vol I., 518; Bridges, Vol. I., 535; Cabinet-work, Furniture & General Carpentery, Vol. II., 1, Canoes, Dug-outs, Troughs, Water-pipes, Drinking-cups, &c., Vol II, 120; Cart & Carriage-building, Vol. II., 183; Carving, Fancy-work, Images, etc, Vol. II, 202; Charcoal Vol II, 264; Combs, Fans, Brush-backs, etc, Vol II, 515; Dandy, Banghi, & Palankin-poles, Vol III, 19; Fuel & Firewood, Vol III., 452; Gun-stocks & Gun-carriages, Vol IV., 189; House-building, Vol IV., 300, Paching-Cases, Vol. VI., Pt. II, 1, Pea-stakes, Pan-houses, Wattle, etc, Vol. VI., Pt. II, 123; Pounders & Presses, Vol VI., Pt. I, 333; Saw-mills, Vol. VI., Pt. II., 483, Sleepers, Vol VI, Pt. III., 252; Tinder & Gun-matches, Vol. VI, Pt IV., 62; Tools & Tool handles, Vol. IV., Pt 70, Walking Sticks, Vol. VI., Pt. IV, 298; Wattle, Vol. VI, Pt. IV, 300, Well-curbs, Vol. VI., Pt. IV., 301; Wheels, Vol. VI., Pt, IV., 307

TIN, *Ball, in Man. Geol. of Ind, III. (Economic), 313.* 460

Tin, and Tin ore, *Mallet in Man. Geol. Ind., IV. (Mineralogy), 54.*

Vern.—*Kallai, ranga, rāng, kathél,* HIND; *Kathir, ranga,* AJMIR; *Tagaram,* TAM.; *Tima, falagh,* MALAY; *Khai ma, khai-ma-phyu,* BURM, *Vanga, ranga, trapu,* SANS.; *Kas-din, resás, abrus,* ARAB; *Urzia,* PERS.

, Cyclop. Ind., III, 889, ...en Powell, Pb. Pr., 10, 104, 129; U. C Dutt, ...na, 50; Mason, Burma 75, 376; Gazetteers.— ...11; Burma Govt. Pro... t and 2B, also many ...urvey, and the Asiatic referred to the autho-

OCCURRENCE. 461

west of Pihra. Tin ore at the former locality occurred in three or four

any discovery of the ore.

In certain parts of the Malay Peninsula and Burma, however ... deposits of tin-stone occur along the base of the granitic rang...

TIN and Tin ore.

OCCURRENCE: Burma.

the former country. Mr. Oldham (*Select Records Govt. of Ind., X., 56*) describes the occurrence of the ore in this region as follows :—"The greatest mineral wealth of the southern portion of the Tenasserim provinces consists in the extensive and valuable deposits of tin-ore which they contain. In the granite of the central dividing range, which separates these provinces from Siam, and more especially (so far as my opportunities for examination extended) towards the outer edge of this granite, or near its junction with the highly metamorphosed slates with which it comes into contact, tin-stone is an essential ingredient in the mass of rock, occurring, disseminated through the granite, in small crystals, similarly arranged to the quartz and felspar of the rock, and in some cases, as at Kahan hill near Mergui, veins of granite cut through and traverse the more recent (*sic.* older)?*—rocks, and contain large and abundant crystals of tin-stone" (*Quoted from Mallet, Mineralogy, loc. cit.*). The deposits for which Tenasserim is famous are situated from the neighbourhood of Yé in the Amherst District, southwards at intervals to Maleewoon, in the extreme south of Mergui. Throughout this tract ore, derived by degradation from the deposits in the rocks above described, may be found in the sand of the beds of nearly every stream; indeed, not only does it occur in this form, but through large tracts it actually impregnates the soil. Owing to the density of the vegetation on the granitic hills, they have never been thoroughly explored for lodes or veins, and therefore it is not known whether the ore may occur locally segregated from the general mass of the rock. The Natives have always confined themselves to working the stream tin, which is easily obtained and is generally of great purity. In certain localities wolfram occurs in association with the stream tin, thus decreasing the value of the ore, and that of the metal produced from it (*Ball*).

Ball mentions the following localities as specially noticed by various writers :—

Amherst. 463 *Amherst and Tavoy Districts.*—Large quantities of tin are believed to have been formerly manufactured in Tavoy, since the traveller **Ralph Fitch** records that in 1586 the whole of India was supplied with tin from the 'island of Tair.' At present the collection of tin, if practised at all, is only on a very small scale. Tin-stone has been reported by English writers from the river Kallee Ung, lat. 14° 48', long. 98° 10', to the south of Yé; from the various streams which empty themselves into the Henzai basin from the south, through the Oung-beng-quin, and from Myit-ta. In the latter locality the streams containing the metal run into the basin of the Upper Tenesserim river. The ore is stated to occur both in the alluvium, and in the granitic detritus from the hills, and is apparently rather abundant in some places. It was worked in former times by the Burmans, and some old pits are as much as 40 feet deep. **Captain Low**, in his *History of Tenasserim*, mentions mines and smelting works at Bubeinchaung near Ke-up-poch, which were being worked in 1825, also deserted at Nayedaung, and Shenze near Kaleaung and Kamanula, one day's journey to the north of Ke-up-poch. These mines were, at one time, worked during four months of the year, gave employment to four hundred men, and yielded a revenue probably not exceeding 1,500 *tickals*.

Mergui. 464 *Mergui.*—Stream-tin occurs in numerous localities in this district, and, in a few instances, tin-stone has been found *in situ*. **Mr. Fryar**, who visited the principal works in 1871, states that they may be enumerated under eleven heads as follows :—(1) Palouk.—This place was alluded to in a communication made to the Asiatic Society as early as 1829, in which it was

* An interrogation added by **Mallet** in quoting this passage.

Tin stone is found. (*J. Murray.*) TIN and Tin ore.

OCCURRENCE.

Burma.

Mergui.

Tenasserim, was considered by Captain Tremenhere to be one of the

the last-mentioned place earned as much as R1 a day. Captain Tre-

which is moved backwards and forwards by manual labour. The tapping hole is permanently open, and the molten tin is accumulated in a well, till

situated about 40 miles up the river of the same name. The sand is obtained at a place three days' journey from the village, sixty men are employed, and all is sent to the furnace at Ma-lee-won (the next de-

OCCURRENCE. Burma.

scribed locality) for smelting. Between the two places there are several other tin-washings. Tin-works also occur at Khenoung in Siamese territory on the opposite side of the river. The sand is brought on elephants from the stream a day's journey off, and 2,000 men are said to be employed. This locality was visited by Dr. Oldham, who was greatly impressed with the system adopted by the proprietor or Governor, an old Chinaman, everything connected with the works being conducted in the most orderly fashion. (11) Ma-lee-won.—A village situated on a tributary of the Pakchan river, the most southern locality in Tenasserim in which tin is worked. The principal washing is 8 miles from the village, where the river-bed is 300 feet wide. The tin-bearing stratum, from 15 to 27 feet beneath the surface, is only itself 2 feet thick, but is very valuable. Between the years 1860 and 1870 the annual rent for these works charged by Government was £272. About the year 1873 the township was leased to a firm of Rangoon merchants for a term of 30 years, originally at the rate of a ground-rent of £1,000 per annum, which, however, merged into a royalty of 7 per cent. Though it is stated that besides the abundant supply of stream tin veins of ore were discovered and opened in the hills, yet the lease was abandoned in 1877, as the expenditure had exceeded the outturn by a large amount. The Chinese again reinstalled themselves with from 80 to 100 workers.

The above information has been condensed from the compilation by Ball, published in 1880. Since then very little appears to have been done in furthering the industry, and the failure of the attempts by Messrs. Steel & Co., appears to have prevented any renewal of British enterprise in this direction.

In 1881 a correspondence took place between the Government of Burma and the Government of India, in which it was recommended by the former that the duty or royalty of 4 per cent. on all tin smelted or otherwise made marketable, which had been enforced since 1873, should be removed. It was urged that this condition had an adverse effect on the tin-mining industry, and that the royalty obtained had varied from R1,378 to R700, a sum too insignificant to be worthy of consideration. A report from the Deputy Commissioner of Mergui was forwarded, in which it was demonstrated that the main difficulties to be contended against in expanding the industry were;—(1) want of communication, (2) want of labour, (3) the difficulty and expense of obtaining supplies, and (4) the great fall in the market value of the metal from £150 per ton in 1872 to £73 in 1877. The advantage of opening free access to and encouraging Chinese immigration was also insisted on. In Upper Burma deposits of ore, or stream-tin, may doubtless be found in considerable quantity, as the mineral resources of the country are completely explored and opened out. Ore is said to have been found in the Shán country, south-east of Mandalay, in the Karenni hills between the Sitang and Salwin, and in the Toung-ngu district; and the Karens are said to work the ore at Kah-may-pew. The total production of tin ores in India during 1889 is said to have been 976 cwt., valued at R55,673, all of which was obtained in Burma (*Statement on Minerals, Rev. and Agri. Dept.*).

DYE. 465

Dye.—Tin is a highly important metal in dyeing as practised in Europe, but in this respect is apparently unknown to the Natives of India. It is employed as a mordant in three different states of chemical composition—namely, as the protoxide, the sesquioxide, and the peroxide or their corresponding chlorides. Generally speaking, the proto-salts are applied to wool, the persalts to cotton, and the sesqui-salts, the consumption of which is more limited, are used in certain cases to both fibres. The compounds in which tin plays the part of an acid, such as the stannites and stamrates,

are almost exclusively restricted to cotton dyeing and printing (*Crookes, Handbook of Dyeing, 519*).

Medicine —Tin has been known in India from a very remote period, and early held mentioned by S or from some tween which ar MEDICINE. 466

Tin, like most of the other metals is used primarily in the metallic state, but is subjected to a complicated process of so-called purification which reduces it to the state of an impure oxide. To accomplish this it is melted, and the molten metal is poured into the milky juice of **Calotropis gigantea**

but he remarks that he does not know of the metal ever being used in Native practice in the South of India. **Irvine** (*Materia Medica of Patna, 50*) states that the oxide is employed as a tonic and aphrodisiac. **Surgeon-Major Robb**, in a note to the Editor, mentions that the same preparation is administered as a remedy for chest affections.

Industrial Uses.—The metal is employed by the Natives of India for making bright toys and imitation jewellery, as well as for tinning copper vessels; it is also beaten out into leaf or thinfoil, and used for a silver paint. The industry of tin-plating is a large and fairly prosperous one, as all Muhammadans, Christians and Pársis, and certain classes of Hindus employ tin-plated vessels extensively. Copper vessels to be safely free from poisonous deposits must be tinned or *kalaied* once a month, thus affording constant employment to a large number of workmen, *qal'aigar* or *kalaigar*, who are all Muhammadans. In Northern India, vessels which are tinned for the first time are boiled in a solution of alum, verdi- USES. 467

re. It is then

and consists TRADE. 468

uring the past fifteen years these have averaged; for the quinquennial period ending

plies were drawn, and the share taken by each importing Presidency

TINOSPORA cordifolia. — Medicinal Properties of Gulancha.

Habitat.—A climbing shrub found throughout Tropical India from Kumáon to Assam and Burma, and from Behar and the Konkan to the Karnatic and Ceylon.

FIBRE. **Fibre.**—The ærial ROOTS are used for tying bundles (*Dymock*).

Medicine.—The STEM, LEAVES, ROOT, and a watery EXTRACT of this
Roots. plant have long been valued in Hindu medicine. The entire PLANT is
471 regarded as a valuable alterative and tonic, and is used in general debi-
MEDICINE. lity, fever, jaundice, skin diseases, rheumatism, urinary diseases, dyspep-
Stem. sia, &c. It enters into the composition of many elaborate prescriptions
472 by Chakradatta and other Sanskrit writers, most of which contain many
Leaves. other more or less powerful medicines. For a description of the most
473 important of these the reader is referred to U. C. Dutt's *Mat. Med. Hindus.*
Root. The plant early attracted the notice of European physicians in India.
474 Fleming remarked on its use as a febrifuge, and as a tonic in gout;
Extract. Ainslie described the root as a powerful emetic, and as a popular remedy
475 for snake-bite, and Taylor states that the watery extract was, in his time,
Plant. administered for leprosy. A little later, a paper was published on the sub-
476 ject by Dewan Ramkamal Sen, in which he described the method of preparing the extract, also a decoction of the stem, root and leaves. O'Shaughnessy states the extract was found to be a very useful tonic in several trials made at the Calcutta College Hospital, though decided febrifuge effects could scarcely be attributed to it. The decoction or cold infusion he described as of very great utility in the treatment of several cases of chronic rheumatism, and of secondary syphilis, its action being decidedly diuretic and tonic in a very high degree.

Gulancha was accordingly admitted to the *Bengal Pharmacopœia* of 1844 and the Indian *Pharmacopœia* of 1868. In the latter a tincture, infusion, and watery extract (which correspond to the *palo* of the Natives) are officinal. Waring corroborates O'Shaughnessy's statements regarding its greater value as a tonic than as an antiperiodic. In Native practice it is valued as a tonic and alterative, antiperiodic and aphrodisiac. "The fresh plant is said to be more efficient than the dry; it is taken with milk in rheumatism, acidity of the urine and dyspepsia. The JUICE with *pakhanbed* and honey is given in gonorrhœa, and is an ingredient in *paushtiks*, given in phthisis. In Guzerát a necklace called *Kamalá-ni-málá* (jaundice necklace) made of small pieces of the stem, is supposed to cure that disease" (*Pharmacog. Ind.*). Moodeen Sheriff considers the drug alterative, tonic, and antipyretic, and states that the root and stem, but especially the extract, are useful in slight cases of fevers, in secondary syphilis and rheumatism, jaundice, general debility after long-standing sickness, and splenic affections. He suggests that one or other of the officinal preparations might be substituted for quinine, James' powder, potassic iodide and sarsaparilla. His remarks in the paragraph of Special Opinions below are interesting and worthy of attention. From all obtainable evidence there appears to be little doubt of the valuable tonic and alterative properties of the drug; whether it is in reality antiperiodic or antipyretic is on the other hand doubtful. It has never come into general use in European practice, nor does it even appear to have attracted much attention out of India. In 1884, however, it again formed the subject of investigation and was reintroduced to the notice of the profession in Europe, as a specific tonic, antiperiodic, and diuretic.

CHEMICAL COMPOSTION.—"The extract called *palo* and *sat-i-galoe* is
Chemistry. simply starch, which, though not having been washed, retains some bitter-
477 ness; that sold in the bazárs is usually nothing but common starch. The stem has been examined by Fluckiger (1884) by boiling it with alcohol and a little hydrate of calcium, the alcohol was then evaporated and the

MEDICINE

residue extracted by means of chloroform. The latter liquid was found to contain an alkaloid in very small quantity; on evaporating it and dissolving the residues by means of acidulated water, a solution was obtained, which proved to contain merely a trace of *berberin*. The alcoholic extract, after it had been exhausted by chloroform as above stated, was dissolved in boiling water and precipitated by tannic acid, avoiding an excess of the acid. The deposit thus obtained was mixed with carbonate of lead, dried and exhausted with alcohol, which, on evaporation, yielded the bitter principle. By boiling this bitter principle with dilute sulphuric acid, sugar was produced, and it lost its bitterness. Neither the original bitter principle nor the product derived from it could be crystallised" (*Pharmacog. Ind.*).

TRADE.—The stem and extract can be obtained in all bazárs. The former costs wholesale R1½ per maund (*Moodeen Sheriff*), R2¼ per Surat maund of 37½lb (*Dymock*), retail about 2 annas per lb. The watery extract fetches R30 per maund wholesale, R1½ per seer retail (*Moodeen Sheriff*). The average annual export of the extract from the Kumáon forests is said to be about 2 maunds. The root is not generally obtainable in the bazár, but can be procured without difficulty at the cost of collection. Trade 478

SPECIAL OPINIONS.—§ "There is a general belief amongst the Muhammadans of India that the *Gul-bél* growing on a Margosa tree is more efficacious as a medicine than that which may be found on other kinds of trees, hedges, etc., and they, therefore, cultivate the plant in their own houses and gardens, and make it run over Melia Azadirachta. The watery extract of the plant (*Satte-giló* or *palo*) is greatly used as a remedy in fevers, and is called 'Indian Quinine,' by some *Hakims*. This is, of course, a great exaggeration of its value, but there is no doubt that it is a very useful drug, especially in some very obstinate, low, and long standing remittent and typhoid fevers. Its action is generally more satisfactory when employed in combination with other drugs of similar medicinal properties. Although it is not a costly drug, yet it is generally substituted by, or adulterated with, many cheaper substances in the bazárs of India, so much so, that out of the seven specimens I have received from different places, including Calcutta, Hyderabad, and Lucknow, none is found to be genuine. They are all very bitter and of various colour; whereas the real *Satte-giló* is either tasteless or slightly bitterish in taste, white in colour, if it is prepared from the roots of T. cordifolia, and greenish white or greenish brown, if from the stems. It occurs in powder or loose and flat cake-like pieces. It is prepared easily, by cutting the fresh stem into small pieces, which are bruised in a stone or wooden mortar and soaked in water from six to twelve hours. The mass is then rubbed, squeezed, and separated from the fluid by straining the latter through cloth. The fluid being evaporated to dryness in the sun, the residue is the *Satte-giló*. The last process is generally repeated several times with a view to make the drug whiter, but such repetitions, in my opinion, are not only unnecessary, but detrimental to its effects. The thicker the *gul-bél* or its root is, the better for the preparation of the *Satte-giló*, and the plant is known to attain sometimes the thickness of a man's arm. A transverse section of the stem and root shows the wood to consists of a very porous tissue, traversed by conspicuous medullary rays, with or without concentric zones. The specimens of the *Satte-giló* in my collection at Calcutta (Nos. 17 and 18) are genuine, being prepared by myself for the late International Exhibition at that place, the former from the stems, and the latter from the roots. The dose of the extract is from one to two drachms" (*Honorary Surgeon Moodeen Sheriff, Khan Bahadur, Triplicane, Madras*). "Have

MEDICINE. used it a little in the shape of decoction of the root, as an antiperiodic, but not successfully" (*Surgeon D. Picachy, Purneah*). "*Gulancha*, which grows on *Nim* trees, is considered most efficacious for remedial purposes" (*Surgeon Anund Chunder Mukerji, Noakhally*). "Tonic and antiperiodic" (*Assistant Surgeon Nehal Sing, Saharunpore*). The bazár extract is starchy in its nature and does not contain the bitter principle of the plant" (*Surgeon-Major Robb, Civil Surgeon, Ahmedabad*). "Bitter tonic and diuretic in the form of decoction" (*Civil Surgeon C. M. Russel, Sarun*). "*Goluncho* is an excellent substitute for Calumba. The starch prepared from the plant is much used, but it is not so efficacious as the infusion" (*Surgeon R. L. Dutt, M.D., Pubna*). "Tonic,—useful in chronic rheumatism and fevers" (*Assistant Surgeon S. C. Bhattacharji, Chanda*). Useful in chronic rheumatism and secondary syphilis" (*Surgeon-Major H. J. Hazlitt, Ootacamund*). "Is a favourite dipensary remedy as a tonic and alterative in the Behar district" (*Surgeon R. D. Murray, M.B., Burdwan*). "In the form of infusion I have heard it recommended for chronic gonorrhœa, leucorrhœa, &c. It is, I believe, employed in leprosy, and the wandering devotees of this country use it as an anaphrodisiac" (*Surgeon J. Ffrench Muller, M.D., Saidpore*). "Used in cases of insanity" (*W. Forsyth, F.R.C.S. Edin., Civil Medical Officer, Dinagepore*). "An extract made from the stems by crushing and infusion, is much valued by the natives as an antiperiodic. It is given in doses of 5 grains, and commands a high price in the bazár. It is superior to cinchona febrifuge" (*Narain Misser, Kathe Bazar Dispensary, Hoshangabad, Central Provinces*). "An antiperiodic and bitter tonic, but inferior to other similar drugs" (*Civil Surgeon S. M. Shircore, Moorshedabad*). "An excellent tonic, preferably given as a decoction of root and stems" (*Civil Surgeon G. C. Ross, Delhi, Panjáb*). "It is much used here in the form of the infusion, either alone or combined with acetate of ammonia, and found useful in ordinary cases of intermittents and other mild forms of fevers" (*Apothecary J. G. Ashworth, Kumbakonam, Madras*). "Is a valuable tonic and febrifuge, used in intermittent fever with great benefit" (*Assistant Surgeon R. Gupta, Bankipur*).

FODDER. Leaves. 479 Stems. 480 Ærial Roots. 481

Fodder.—The LEAVES are good fodder for cattle; the STEMS and ÆRIAL ROOTS are much liked by elephants.

DOMESTIC & SACRED. Plant. 482

Domestic and Sacred.—Ainslie remarks that the PLANT is often bruised and put into water, the liquid thus formed being "drunk by the Brahmins at some of their religious ceremonies. It is stated in the Nasik Gazetteer (*Bombay, XVI., 323*) that an intoxicating liquid called *bhoja* is prepared by boiling the seeds of old *joari* (Sorghum vulgare), *gulvel* (Tinospora cordifolia), *bháng*, and *kuchala* (Strychnos Nux-vomica) in water. [Could the Sanskrit name *Soma vallí* be in any way connected with this remarkable property? *Ed.*]

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Tinospora crispa, *Miers; Fl. Br. Ind., I., 96.*

Syn.—MENISPERMUM CRISPUM, *Linn.*; M. VERRUCOSUM, *Roxb.*; M. TUBERCULATUM, *Lamk.*; COCCULUS CRISPUS, *DC.*; C. VERRUCOSUS, *Wall.*

Vern.—Same as those of **T. cordifolia.**

References.—*Roxb., Fl. Ind., Ed. C.B.C., 730; Kurz., For. Fl., Burm., I., 52; O'Shaughnessy, Beng. Dispens., 202; Fleming, Med. Pl. & Drugs, as in As. Res., XI., 171; Pharm. Ind., 11; Flück. & Hanb., Pharmacog., 34; Dymock, Warden & Hooper, Pharmacog. Ind., I., 64; Agri.-Horti. Soc. Ind., Journ. (New Series), V., Pro., 48.*

Habitat.—Met with from Sylhet and Assam to Pegu and Malacca.

MEDICINE. 484

Medicine.—It possesses the bitterness, and probably the tonic properties, of *gulancha*, and is known by the same vernacular names. According

to Captain Wright, quoted by Fleming, it is as powerful a febrifuge as Cinchona.

TITANIUM. 485

This metal does not occur native, but is generally found in combination with oxygen and iron as *titaniferous iron, mechachanite* or *ilmenite*. Combined with oxygen alone it forms *titanic acid*, or *rutile*.

Ti

generally be found to be associated

Bengal.

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lamellar plates or seams have been seen there *in situ* in quartz veins" (*Ball*).

Rajputana.—According to Mr. Hackett *rutile* occurs in certain quartz veins which traverse the Arvali rocks of the Motidongri range, a short distance south of Alwar. Rajputana. 488

Tobacco, see Nicotiana Tabacum, *Linn.*; SOLANACEÆ, Vol. V., 353-428.

Tobacco, Mountain—see Arnica montana, *Linn.*; COMPOSITÆ, Vol. I, [318

TODDALIA, *Pers.; Gen. Pl., I., 300.*

Toddalia aculeata, *Pers.; Fl. Br. Ind., I., 497;* RUTACEÆ. 489

TODDALIA aculeata.

A valuable medicinal product.

Pl. Bomb. (XXV., Bomb. Gaz.), 148; Bidie, Prod. S. Ind., 5, 108; Boswell, Man. Nellore, 128; Gribble, Man. Cuddapah, 199; Gazetteers:—Bombay, XV., 429; Orissa, II., 181; Ind Forester, III., 238; IX., 451.

Habitat.—A rambling shrub, found in the Sub-tropical Himálaya, from Kumaon eastwards to Bhután, ascending to 5,000 feet; also in the Khásia mountains, ascending to 6,000 feet, and throughout the Western Peninsula and Ceylon.

DYE. Root-Bark. 490

Dye.—Dr. Bidie remarks that the ROOT-BARK is used in Madras as a yellow dye-stuff. It yields its colouring matter to water, but nothing is known as to how the colour may be fixed.

OIL. Leaves. 491

Oil.—The authors of the *Pharmacographia Indica* state that the LEAVES yield, on distillation, a pale yellowish-green limpid oil, having the odour of citron peel, and a bitter and aromatic taste. It has a specific gravity at 17°C of ·873; examined by polarized light in a tube of 200 mm., it rotates 15·30° to the left; it has no constant boiling point, but the greater part distils over between 190° and 210°.

MEDICINE. Fruit. 492 Root. 493 Leaves. 494 Bark. 495

Medicine.—This plant early attracted European attention in India, as perhaps one of the most valuable of Indian medicinal products. Rheede mentions the unripe FRUIT and ROOT, stating that they are rubbed down with oil to make a stimulant liniment for rheumatism. Roxburgh writes, "Every part of this shrub has a strong pungent taste. The roots when fresh cut smell particularly so. The fresh LEAVES are eaten raw for pains in the bowels; the ripe berries are fully as pungent as black pepper, and with nearly the same kind of pungency; they are pickled by the Natives, and a most excellent one they make. The fresh BARK of the root is administered by the Telenga physicians for the cure of that sort of remittent, commonly called the hill, fever. I conceive every part of this plant to be possessed of strong stimulating powers, and have no doubt but under proper management it might prove a valuable medicine where stimulants are required." Ainslie repeats Roxburgh's remarks, and adds that, in Southern India, the root is considered stomachic and tonic, being given in weak infusion to the quantity of half a tea-cupful in the course of the day. Later writers have done little to add to our knowledge of the virtues of this medicine. O'Shaughnessy simply reiterates the above, adding that the root-bark deserves most careful trial and will in all probability be found a very valuable medicine. Dr. G. Bidie, some years later, gave strong testimony in favour of its stimulant, tonic, and carminative properties, adding that he knew of no single remedy in which all these qualities were so happily combined. It was accordingly made officinal in the compilation of the *Indian Pharmacopœia*, where its administration is recommended in "constitutional debility and convalescence after febrile and other exhausting diseases." The officinal preparations are a tincture and an infusion of the root-bark, which is advised to be used fresh. Mooden Sheriff has lately written in the highest terms of the root-bark, which he considers to be decidedly diaphoretic, antiperiodic, and antipyretic, in addition to the qualities generally ascribed to it. His remarks will be found below in the paragraph of Special Opinions.

Flückiger & Hanbury inform us that the drug once enjoyed some celebrity in Europe under the name of "Lopez Root," or more precisely "Radix Indica Lopeziana," or "Root of Juan Lopez Pigneiro." It was first made known in 1671 from specimens obtained by Pigneiro at the mouth of the Zambesi. The drug was actually introduced into European medicine by Gaubins in 1771 as a remedy for diarrhœa, and acquired so much reputation that it was admitted to the *Edinburgh Pharmacopœia* of 1792. It appears to have been for sometime imported from Goa, but its

botanical origin and source were entirely unknown, and it was always extremely rare and costly. It has long been obsolete in all European countries except Holland, where, until recently, it was to be met with in the shops. The *Pharmacopœia Neerlandica* of 1851 says of it, "Origo botanica perquam dubia—Patria malacca?" (*Pharmacographia*) The disuse into which the drug has fallen in Europe contrasts strongly with the opinion expressed almost unanimously in its favour by Indian physicians. This may, however, most probably be due to the root-bark becoming inferior, if not, inert, when old and dry. MEDICINE.

CHEMICAL COMPOSITION.—"None of the constituents of the Toddalia root of India have yet been satisfactorily examined The bark contains an essential oil, which would be better examined from fresh than from dry material. The tissue of the bark is but little coloured by salts of iron. In the aqueous infusion, tannic acid produces an abundant precipitate, probably of an indifferent bitter principle, rather than of an alkaloid. We have been unable to detect the presence in the bark of *berberine*." (*Flückiger & Hanbury*). It is to be regretted that no Indian chemist has as yet worked up the composition of the fresh material, as suggested by the authors of the above passage Such an analysis might go a long way towards confirming, or otherwise, the statements of those who hold in such strong terms that it is a valuable antipyretic, and might result in the separation of a valuable alkaloid. In any case it would be extremely satisfactory to have an authentic analysis of this, one of the most highly praised, and at the same time cheapest of Indian medicines. Chemistry. 496

SPECIAL OPINIONS.—§ "I have been using the root-bark in my practice for the last sixteen or seventeen years, and do not hesitate to say that it is, as an antiperiodic and antiphyretic, equal, if not superior, to quinine and other alkaloids of Cinchona and to Warburg's tincture, respectively. As a diaphoretic, it is decidedly superior to Pulv. Jacobi Vera, and as a tonic to Gentian and Calumba. It is highly useful in effecting a cure in all idiopathic and uncomplicated fevers, whether periodical or continued It is best used in tincture and decoction, and I make these preparations three or four times stronger than those generally in use This is the chief reason, I think, which has rendered the drug so successful in my hands The analogy between the medicinal properties of the root-bark of T aculeata and those of the root of Berberis aristata and a few other species of Berberis is very great and complete, there being no difference whatever. Therefore, everything I have said about the preparations, doses, therapeutic uses and the manner of using the tincture and decoction of the latter, is quite applicable to those of the former" (*see* B. aristata, *D C.*; Vol. I., 443). "The drug under consideration, however, has one great advantage over the root of B. aristata and other species of Berberis—namely, that it is procurable in every large bazár of Southern India; whereas the root of the latter plants, must be procured from distant places, such as the Nilghiris, Shevaroy Hills, Central and Northern India, &c." (*Honorary Surgeon Moodeen Sheriff, Khan Bahadur, Triplicane, Madras*). "A very valuable tonic, &c." (*Apothecary T Ward, Madanapalle*). "Used in Madras Hospital" (*Surgeon-General W. R Cornish, F.R C.S., C.I.E., Madras*). "This has been only lately used here in one case of debility after fever, and as a tonic proved useful" (*Apothecary J. G. Ashworth, Kumbakonam, Madras*).

Food.—The fresh LEAVES are eaten raw, and the ripe BERRIES are pickled by the Natives of the Coromandel coast; both have a strong pungent taste. FOOD. Leaves. 497 Berries 498

Toddy, see Borassus flabelliformis, *Linn.*, Vol. I., 495; Caryota urens, *Linn.*, Vol. II., 208; Cocos nucifera, *Linn.*, Vol. II., 446, 448, 449, 451, 454, 457; Melia Azadirachta, Vol. V., 211; Narcotics, Vol. V., 334, Phœnix dactylifera, *Linn.*, and P. sylvestris, *Roxb.*, Vol. VI., 199, 215; Sugar (Sacharum) Vol. VI. Pt. II., 115, 118, 138, 226-227, 231, 266, 270, 310, 352, 361, 370; Spirits, Vol. VI., Pt. III.

Tomato, see Lycopersicum esculentum, *Mill.*; SOLANACEÆ; Vol. V., 100.

TOOLS & TOOL-HANDLES.

499 **Tools & Tool-handles**, Timbers used for—

Acacia arabica, *Willd.*
Anogeissus latifolia, *Wall.*
Bamboos, various species.
Carapa moluccensis, *Lam.*
Cassia marginata, *Roxb.*
Cratoxylon neriifolium, *Kurz.*
Dalbergia cultrata, *Grah.*
D. latifolia, *Roxb.*
Dodonæa viscosa, *Linn.*
Eugenia tetragona, *Wight.*
Grewia oppositifolia, *Roxb.*
G. tiliæfolia, *Vahl.*
Lagerstrœmia parviflora, *Roxb.*
Melanorrhœa usitata, *Wall.*
Mesua ferrea, *Linn.*
Murraya exotica, *Linn.*
Putranjiva Roxburghii, *Wall.*
Quercus Ilex, *Linn.*
Rhododendron arboreum, *Sm.*
Rhus Wallichii, *Hook.f.*
Shorea obtusa, *Wall.*
Terminalia paniculata, *W. & A.*
Xylia dolabriformis, *Benth.*

The above enumeration includes the timbers mentioned by such authorities as Brandis, Stewart, Gamble, and others, as being specially employed for making the handles and shafts of axes, hammers, chisels, and such tools. The reader is referred for information regarding each, to its alphabetical position in this work.

Toon Wood, see Cedrela Toona, *Roxb.*; MELIACEÆ; Vol. II., 232.

TOPAZ, *Ball, Man. Geol. Ind., III.*, 530.

500 **Topaz** may be defined as a fluo-silicate of alumina, which may be represented by the formula $Al_2O_5Si.$, with part of its oxygen replaced with fluorine. In crystalline structure it belongs to the trimetric system, but the prisms are differently modified at either extremity. The Topaz is only found in metamorphic rocks or in the veins which traverse these. In colour it varies remarkably. The so-called "Brazilian ruby" is a yellow topaz, which becomes pale pink on exposure to heat. The stones obtained from Siberia have a bluish tinge. The Saxon topazes are of a pale wine-yellow but become limpid on exposure to heat. Those found on the Scotch Highlands are of a sky-blue colour. The present and most valued stones are obtained in Brazil, where they are termed *Goutte d'Eau* (drops of water), but in trade are often spoken of as "Brazilian Sapphires." They are of a deep celestial blue, and when cut in facets they closely resemble the diamond in lustre and brilliance. Brazilian rubies and sapphires may readily be distinguished from the true gems by their inferior hardness, though they are much superior in that respect to rock crystals. The "oriental topaz" is in reality a yellow sapphire or corundum. Of the occurrence of topaz in India, Ball says "there appears to be no authentic record, a reported discovery in the basalt of the Rajmahal hills being open to question. Ceylon, it is believed, yields a not inconsiderable proportion of the Topaz of Commerce."

For further information consult the article on the INFERIOR GEMS given under "Carnelian," Vol. II., 167.—*Ed, Dict. Econ. Prod.*

TORENIA, *Linn.*; *Gen. Pl.*, *II.*, 954.

Torenia.—A genus of glabrous or pubescent herbs, which belongs to the Natural Order SCROPHULARINEÆ, and comprises some twenty species, indigenous in Tropical Asia and Africa. Of these about twelve are natives of India, but only one possesses any economic interest, and that of the smallest kind. This plant, **T. asiatica**, *Linn.*, *Fl. Br. Ind.*, *IV*, 277, is known on the Malabar coast as *kákápu*. Rheede informs us that the JUICE of its LEAVES was considered, during his time, to be a cure for gonorrhœa. Modern writers, however, do not mention it, with the exception of Dymock, who does so only to quote Rheede's remark, and to observe that in the Konkan, where it is pretty common, it possesses no reputation as a medicine. 501

MEDICINE. Leaves 502
Juice. 503

Tortoises and Turtles, see Reptiles, Vol. VI., Pt. I, 428-435.

TRADESCANTIA, *Linn.*; *Gen. Pl.*, *III.*, 853.

Tradescantia axillaris, *Willd.*; *Roxb.*, *Fl. Ind.*, *Ed. C B C.*, 280; [COMMELINACEÆ. 504

Vern.—*Baga nella*, HIND.; *Gola gandi*, TEL.

References.—*Mason, Burma & Its People*, 435; *Dymock, Mat. Med. W. Ind., 2nd Ed.*, 842; *Rheede, Hort. Mal.*, X., *t.* 13; *Cor. Pl.*, 2, *t.* 107.

Habitat.—An annual, native of moist pasture ground, borders of rice-fields, etc., throughout India.

Medicine.—According to Rheede a decoction of this PLANT is considered a useful remedy on the Malabar coast in cases of tympanitis. MEDICINE. Plant. 505

Food and Fodder.—In the last Deccan famine the SEEDS were largely used by the people as food-grains (*Dymock*). Roxburgh states that cattle are very fond of the PLANT. FOOD & FODDER Seeds. 506 Plant. 507

TRAGACANTH.

Tragacanth.—A gum obtained from several species of **Astragalus**, which mostly inhabit South Europe, Asia Minor, and Persia, but none of which are natives of India (*see* Vol. I., 348). It is of a dull white colour, translucent, inodorous, and tasteless. In India the gums of the following are employed as substitutes for Tragacanth :— 508

Cochlospermum Gossypium, *DC.*; Vol. II, 413.

Sterculia urens, *Roxb.*, Vol. VI., Pt. III.

Hog Tragacanth, the produce of **Prunus Amygdalus**, imported into Bombay from Persia (*see* VI., Pt. I., 343). [For further information consult the article Bassora, I., 417.—*Ed.*]

TRAGIA, *Linn.*; *Gen. Pl.*, *III*, 329.

Tragia involucrata, *Linn.*; *Fl. Br. Ind.*, *V*, 465; EUPHORBIACEÆ. 509

Var. α, proper,—*var.* α, RHEEDIANA, δ, GENUINA, & γ, HISPIDA, *Muell.*; T. HISPIDA, *Willd.*

β, cordata,—*var.* CORDATA, *Muell.*; T. CORDATA, *Heyne*; *var.* MONTANA, *Thwaites*; T. MONTANA, *Muell.*

γ, angustifolia.

δ, cannabina, *var.* ε, INTERMEDIA & ζ, CANNABINA, *Muell. Arg.*; T. CANNABINA, *Linn.*; T. HISPIDA, *Herb. Russell*; CROTON HASTATUS & URENS, *Linn.*

Vern.—*Barhantá*, HIND.; *Bichati*, BENG.; *Sengel sing*, SANTAL; *Kánch-kúre*, DEC.; *Kánchkúri*, *khâj-kolti*, BOMB.; *Kán chúri-vayr*, var. cannabina=*sirrú-kánchori-vayr*, TAM.; *China-dúla gondi*, *révati-dula gondi*, *trinadula gondi*, *duruda-gunti*, *tella dura dagondi*, TEL.; *Vrischikali*, *dúst parisha*, *kásághini*, SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 651, 652; Kurz, For. Fl. Burm., II., 398; Thwaites, En. Ceyl. Pl., 210; Dalz. & Gibs., Bomb. Fl., 228; Grah., Cat. Bomb. Pl., 186; Burm., Fl. Zeyl., 202, t. 92; Rheede, Hort. Mal., II., t. 39; Sir W. Elliot, Fl. Andr., 39, 47, 164; Rev. A. Campbell, Ec. Pl. Chutia Nagpur, No. 75, 79; Ainslie, Mat. Ind., II., 61, 62, 389; U. C. Dutt, Mat. Med. Hind., 324; Dymock, Mat. Med. W. Ind., 2nd Ed., 717, 718; Taylor, Topog. of Dacca, 54; Boswell, Man. Nellore, 122, 137; Bidie, Prod. S. Ind., 58; Gazetteers:—Bombay, XV., 443; N.-W. P., IV., lxxvii.*

Habitat.—A common stinging weed, found in dry places throughout India, from the Panjáb and Lower Himálaya of Kumáon eastwards to Assam, and southwards to Burma, Travancore, and Ceylon.

MEDICINE. Root. 510 Medicine.—Rheede noticed the medicinal properties of the ROOT, stating that it was valued in febricula and in itching of the skin. Ainslie writes, "The *Vytians* reckon it amongst those medicines which they conceive to possess virtues in altering and correcting the habit, in cases of *mayghum* (cachexia) and in old venereal complaints attended with anomalous symptoms. By the Hindu doctors of the Coromandel coast it is given in quantity of half a tea-cupful of the decoction twice daily. Taylor states that the root forms the basis of an external application in leprosy, while the LEAVES dried, reduced to powder, and mixed with ginger and *kaiphul*, form an "errhine," which is prescribed in cases of headache. In the Konkan, according to Dymock, the root is used to aid the extraction of guinea-worm, a paste made from them being applied to the part. A paste with *tulsi* juice is also employed in the same locality as a cure for itchy skin eruptions. Campbell notes, that in Chutia Nagpur, the root is given when the extremities are cold during fever; also for pains in the legs and arms. Ainslie describes *var.* cannabina separately, writing that "The root, which is sometimes called *coorundootie vayr*, has, in its dried state, but little taste or smell, though in its more succulent condition it has a rather pleasant odour; it is considered as diaphoretic and alterative, and is prescribed in decoction, together with other articles of like virtues to correct the habit; an infusion of it is also given as a drink in ardent fever, in the quantity of half a tea-cupful twice daily."

Leaves. 511

Fruit. 512 SPECIAL OPINIONS.—§ "The FRUIT rubbed over the head with a little water is useful in cases of baldness" (*Civil Surgeon J. H. Thornton, B.A., M.B., Monghyr*). "The root, boiled in milk, is an occasional remedy for dry cough" (*T. Ruthnam Moodelliar, Chingleput, Madras Presidency*).

TRAGOPOGON, *Linn.; Gen. Pl., II., 530.*

513 **Tragopogon porrifolium**, *Linn.; Fl. Br. Ind., III., 418;*

THE SALSIFY. [COMPOSITÆ.

References.—*Stewart, Pb. Pl., 131; DC., Orig. Cult. Pl., 44; Jour. Agri.-Horti. Soc., IV. (New Series), 37.*

Habitat.—A herb, with milky-juice, found wild in Greece, Dalmatia, Italy, and Algeria (*DeCandolle*); also in Western Tibet, and in cultivated places near Simla.

FOOD. Root. 514 Food.—The young ROOT is eaten as a vegetable in Lahoul (*Stewart*). [Its uses are similar to those of Scorzonera, which see—*Ed.*]

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TRAP.

Trap.—The Editor is indebted for the following note to Mr. H. B. Medlicott, late Director of the Geological Survey. For further economic information the reader is referred to the article Stones, *Vol. VI., Pt. III.*

TRAPA bispinosa

GREENSTONE, WHINSTONE (*including* Basalt, Dolerite, Diorite, etc.). TRAPP, *Fr.*; TRAPPE, BASALT, DOLERIT, ANAMESITE, *Germ.*, BASALTITE, *Ital.* (*J. Murray.*)

Rocks.

The greater part of Western India, particularly in the Deccan and the Central Provinces, is occupied by vast trappean or basaltic accumulations. From north to south these rocks extend continuously from a point 100 miles south of Gwalior to the vicinity of Goa, and from west to east from Bombay to Amarkunkak, covering an area of above one-sixth of the Peninsula south of the Ganges. Great outliers of the same formation occur to the west in Káthiáwár and Cutch, and eastwards in Chutia Nagpur, and stretching southwards through Bustan to Rajamundry on the Godavari. A similar basaltic formation, but of different age, forms the whole of the Rajmahal hills, in Bengal, and reappears again over a small area at the base of the Khásia hills in Eastern Bengal.

In the form of dykes trap of the same ages occurs extensively in the coal fields and elsewhere. Dykes of much older dioritic trap occur freely, sometimes in great profusion, in the metamorphic rocks that cover such large areas in India. Trappean rocks have been, by preference, in many cases selected for temple-building and particular architectural or religious sculptures throughout India, not only when the rock is *in situ*, but often enough at long distances from its place of occurrence.

TRAPA, *Linn.*; *Gen. Pl.*, *I*, *793.*

Trapa bispinosa, *Roxb.*; *Fl. Br. Ind.*, *II*, *590*; ONAGRACEÆ. 516

THE SINGHÁRA NUT.

Syn.—T. QUADRISPINOSA, *Wall.*, *nor of Roxb.*

Vern.—*Singhárá*, HIND.; *Paniphal*, BENG.; *Gaúnri*, KASH.; *Gaúnri*, *singhára*, PB.; *Shingodá*, *singadi*, GUZ.; *Shingadá*, MAR.; *Shingári*, DEC.; *Singhara*, TAM.; *Kubyakam*, TEL.; *Karim-polam*, MALAY.; *Sringutaka*, SANS.

References.—*Roxb.*, *Fl. Ind.*, *Ed. C.B.C.*, *143*; *Kurz*, *in Jour. As. Soc.*, *1877*, *Pt. ii*, *91*; *Dalz. & Gibs.*, *Bomb. Fl.*, *99*; *Stewart*, *Pb. Pl.*, *89*; *Rheede*, *Hort. Mal.*, *XI*, *t. 33*; *Works of Sir W. Jones*, *V*, *83*; *Ain-i-akbari*, *Gladwin's Trans.*, *I.*, *85*; *U. C. Dutt*, *Mat. Med. Hind.*, *319*; *S. Arjun*, *Bomb. Drugs*, *57*; *Murray*, *Pl. & Drugs*, *Sind*, *189*; *Cat. Baroda Durbar*, *Col. & Ind. Exhib.*, *No. 176*; *Baden Powell*, *Pb. Pr.*, *262*, *263*; *Drury*, *U. Pl.*, *437*; *Lisboa*, *U. Pl. Bomb.*, *157*; *Birdwood*, *Bomb. Pr.*, *155*; *Royle*, *Ill. Him. Bot.*, *214*; *Atkinson*, *Ec. Prod.*, *N.-W. P.*, *V. (Foods)*, *13*, *15*; *Stewart*, *Foods of the Bijnor Dist.*, *474*; *Kew Off. Guide to the Mus. of Ec. Bot.*, *69*; *Jour. As. Soc. Beng.*, *Pt. II*, *No. II.*, *1867*, *80*; *Gazetteers:—Mysore & Coorg*, *I.*, *68*; *N.-W. P.*, *I.*, *57*; *II*, *375*; *III.*, *225*; *Panjáb*, *Gurgáon*, *86*; *Settlement Reports:—Panjáb*, *Delhi*, *27*; *C. P.*, *Chanda*, *83*; *N.-W. P.*, *Allahabad*, *37*; *Ind. Forester*, *III*, *238*; *XIV.*, *392*; *Agri.-Horti. Soc. Ind.*, *Journ. (New Series)*, *VI*, *xi.*, *xxiv.*; *Ind. Agri.*, *Feb. 1889*, *91*; *Trop. Agri.*, *January 1889*, *502.*

Habitat.—A floating herb, found on lakes, tanks, and pools throughout India and Ceylon.

DYE. Fruit. 517

Dye.—The ground FRUIT is employed, in certain parts of the country, for making the red *gulal* powder used during the *Holi* festival. (*See* Abir, *Vol. I*, *pp. 6-7.*)

MEDICINE. Nuts. 518

Medicine.—The NUTS are considered by the Natives of the Panjáb and North-West to be cooling and useful in bilious affections and diarrhœa. They are also employed externally in the form of poultices.

FOOD. Kernel. 519

Food.—The KERNEL of the fruit is much used as an article of food in localities where the plant is to be found in any quantity. It abounds in starch, resembles the chestnut in flavour, and is eaten either raw or

TRAPA bispinosa.

The Singhara Nut.

FOOD.

cooked, especially by the Hindús, for it is *phalahár*, *i.e.*, it may be eaten during fasts. It may be boiled whole, after soaking a night in water, roughly broken up and made into a sort of porridge, or ground to a fine meal and made into *chapattis*.

It is cultivated extensively in Kashmír, and in the lakes, tanks, and freshwater reservoirs of the North-West and Central Provinces. In Kashmir it is said to furnish almost the only food of at least 30,000 people for five months of the year. Stewart, quoting from Moorcroft, states that, from the Wúlar lake in Kashmir, ninety-six to one hundred thousand ass-loads were, in his time, taken annually, the Government drawing R9o,000 duty from this source. He further mentions on "good authority" that the Maharája annually obtained more than a lakh of rupees as duty from the Singhara nut. Many boat-loads filled with the fruit arrive daily at Srinagar.

Atkinson, quoting from Colonel Sleeman and other sources, gives the following account of *singhára* in the North-West Provinces:—"It is cultivated chiefly by *Dhímars* and *Kahárs*, who have spaces regularly marked out by bamboos, for which they pay rent to the landholder. The long stalks reach the surface of the water, on which float the green leaves, and amongst them the white flowers expand their petals towards evening. In the end of January the seed or fruit is scattered at the rate of a maund of 82lb to a local *bígha*, over the water where it is sufficiently deep to preclude all chance of its drying up before the advent of the periodical rains. The seeds are then pressed into the mud with sticks or the feet, and in a month or two they begin to throw out shoots. In June, just before the rains set in, the excess is thinned out and transplanted, the produce of one *bígha* serving for three or four; the roots are taken between the great and first toe of the planter's foot and thus fixed in the mud. The long stalks of the plant reach up to the surface of the water, on which the bright green leaves float, supporting in the middle a pure white flower. In October the nut forms under the water; it is of triangular shape, covered with a rough brown integument, adhering strongly to the kernel and armed with spines; hence its name. The kernel is white and esculent and of a fine cartilaginous texture. The fruit is gathered in November and December. In Hamírpur in the Mahoba Pargana, a local *bígha*, measured by bamboos 18 feet long, of which 12 by 2 make a *singhárá bígha*, yields 3 to 4 maunds of produce worth about R2 to R4 a maund. The rent is about R1 to R3 a *bígha*, *kankar* in the soil being esteemed unfavourable, and rich mud fetching the highest rent. The Dhímars of Hamírpur generally take the lease of a lake at a fixed rent, and divide it among themselves, their respective cultivations being marked by upright sticks, the removal of which, as of boundary marks on the shore, leads to many a quarrel.

Their great enemy is an insect called *bandu*, which in both stages of grub and fly feeds on the plant, eating through the husks, and thus destroying the fruit, which on being exposed to the water spoils. The labour of killing these and clearing away the weeds is great. In Cawnpore a kind of raft is made by joining two earthen vessels together by a bamboo, astride which, or resting his arms on which, the *kahár* paddles about to clear off the insects. For the cultivation flat-bottomed canoes are used, scooped out of the trunk of a single *mahúa* tree, costing about R5 each to make, and lasting fifteen to twenty years. They carry two men and are pushed on by bamboo, and when not used are sunk in the water till again wanted. The cultivation of this fruit forms one of the most important sources of the miscellaneous revenue in villages." In the Delhi District of the Panjáb the *singhára* nut is similarly cultivated, and is said to yield a considerable revenue. The following passage also occurs in the *Land*

FOOD.

Revenue Settlement Report of the Jubbulpore District of the Central Provinces: "In the highly cultivated central portion of the district the principal *sayer* income consists of rents from tanks devoted to the culture of the *singhára*, sometimes yielding a considerable item, of from R50 to R200. It constitutes an article of export." In Guzerát, also, the nut forms an important article of diet, and in Manipur, according to Dr. Watt, the immense lakes to the south of the valley afford food for a few months to a large community.

It has been suggested at various times that the food-supply of localities in which water abounds might be very greatly augmented by extending the cultivation of this plant. It affords a palatable food which, even in good seasons, would be freely used by the agricultural population, who would thus secure a considerable addition to their surplus outturn of rice and other food-grains for export. In bad seasons, on the other hand, the large adventitious source of food-supply would form a stand by, when other crops might altogether fail. It has been specially recommended that the plant should be experimentally grown in the great reservoirs and artificial lakes of the Madras Presidency.

But it must be remembered that the crop is not unattended with disadvantages. Thus Colonel Sleeman (*Rambles of an Indian Officer*) remarks that mud increases very rapidly from its cultivation, which should consequently be carefully prohibited where it is thought desirable to keep up the tank purely for the sake of the water. On the other hand, in stagnant and foul waters it may do good; the Chinese, indeed, believe that an allied species, T. bicornis, absorbs the putrid emanations which arise from such sources.

TREMA, *Lour.; Gen. Pl., III., 355.*

Trema amboinensis, *Blume; Fl. Br. Ind, V., 484,* URTICACEÆ. 520

Syn.—T. ORIENTALIS *var.* AMBOINENSIS, *Kurz*, T. VELUTINA & BURMANNI, *Blume*, SPONIA AMBOINENSIS, *Dcne.*; S GRIFFITHII, *Planch.*, S AMBOINENSIS & VELUTINA, *Miq.*; S VELUTINA, *Planch*; S BURMANNI, *Planch*, CELTIS AMBOINENSIS, *Willd.*, C. TOMENTOSA, *Roxb.*, C. CAUDATA, *Wall.*

Vern.—*Jháwár*, SANTAL.

References.—*Roxb., Fl. Ind, Ed. C.B.C, 263, Kurz, For Fl. Burm, II, 469, Beddome, For. Man, 219, Campbell, Ec. Pl, Chutia Nagpur, No. 8714.*

Habitat.—A small evergreen tree, found in hot valleys in the Sikkim Himálaya, Assam, Sylhet, and southwards to Singapore, also in the Andaman Islands.

DOMESTIC. Leaves. 521

Domestic.—Campbell states that the rough LEAVES are used in Chutia Nagpur for polishing wood in place of sand-paper.

orientalis, *Blume; Fl. Br. Ind., V., 484; Wight, Ic., t. 1971.* 522

THE INDIAN NETTLE TREE, or CHARCOAL TREE.

Syn.—SPONIA ORIENTALIS, *Planch.*; S. WIGHTII, *Planch.*; CELTIS ORIENTALIS, *Linn. (in part).*

Vern.—*Chikun*, BENG.; *Badu manu*, C. P.; *Kúail*, NEPAL; *Tugla*, LEPCHA; *Param*, MICHI, *Jupong, phakram, jigini, sapong, sempak, amphak, opang*, ASSAM; *Gol, khargul*, BOMB.; *Mini*, TAM.; *Gadanelli*, TEL.; *Gorklu*, KAN.; *Gol.*, MAR.; *Rukni*, BAIGAS; *Sap-sha-pen*, BURM.

References.—*Roxb, Fl. Ind., Ed C.B.C., 262; Kurz, For. Fl. Burm., II, 468; Brandis, For. Fl, 430; Beddome, Fl. Sylv, t. 311; For. Man., 219; Gamble, Man. Ind. Timb, 344; Dalz. & Gibs., Bomb. Fl., 238; Lisboa, U. Pl. Bomb, 132.*

Habitat.—A small evergreen tree, met with along the foot of the Nepal and Sikkim Himálaya, in Bengal, Behar, and southwards to Travancore and Singapore, common in Ceylon. It comes up self-sown in forest clearings and waste places, often in great profusion, and may be utilised in plantations to keep down the grass jungle. According to **Van Someren**, it is often allowed to grow for shade in the Mysore and Coorg coffee plantations (*Gamble*).

FIBRE. Bark. 523 **Fibre.**—The inner BARK yields a FIBRE which is used for tying the rafters of native houses, and for binding loads; and in Assam for making the coarse sackcloth (*Gamble*).

TIMBER. 524 **Structure of the Wood.**—Light reddish-grey, soft, growth extremely fast; weight [illegible] per cubic foot. It is employed for making charcoal for the manufacture of gun-powder.

TREWIA, *Linn.; Gen. Pl., III., 318.*

(*1670-1 (excl. fem. fl.)*; EUPHORBIACEÆ.

525 **Trewia nudiflora**, *Linn.; Fl. Br. Ind., V., 423; Wight, Ic., t.*

Syn.—T. MACROPHYLLA, *Roth.*; T. MACROSTACHYA, *Klotzsch*; ROTTLERA INDICA, *Willd.*, TETRAGASTRIS OSSEA, *Gaertn.*

Vern.—*Tumri*, [illegible], [illegible], [illegible], HIND.; *Pitali*, BENG.; *Monda*, [illegible]; *Gotel hadaru*, KOL; [illegible], MONGHYR; *Garum gamari*, [illegible], NEPAL; *Tungplam*, LEPCHA; *Bhillaur*, *bhillaura*, OUDH; *Tumri*, [illegible], KUMAON; *Pettari*, *tumri*, *bhillauri*, BOMB.; *Pitari*, MAR.; *Kat-kumbla*, KAN.; *Thitmyaw*, [illegible], BURM.; [illegible], MAGH.; *Pindara*, SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 740; Brandis, For. Fl., 443; Kurz, For. Fl. Burm., II., 377; Beddome, Fl. Sylv., t. 271; Gamble, Man. Timb., 357; Graham, Cat. Bomb. Pl., 175; Dalz. & Gibs., Bomb. Fl., 231; Rheede, Hort. Mal., I., t. 42; U. C. Dutt, Mat. Med. Hind., 313; Atkinson, Him. Dist., 317; Lisboa, U. Pl. Bomb., 122, 171; For. Adm. Rept., Chutia Nagpur, 1885, 34; Gazetteers:—Bombay, XIII., 26; XV., 75, 442; N.-W. P., IV., lxxv.*

Habitat.—A large, deciduous tree, common in the hotter parts of India from Kumáon southward and eastward to Assam, Malacca, and Ceylon.

FOOD. Pulp. 526 **Food.**—The PULP under the rind of the fruit is said to be sweet and edible. It must, however, be small in quantity, for **Sir J. D. Hooker** describes the fruit as "almost woody."

TIMBER. 527 **Structure of the Wood.**—White, soft, not durable; weight 28 to 29lb per cubic foot. It is used for making Native drums and agricultural implements (*Gamble*).

TRIANTHEMA, *Linn.; Gen. Pl., I., 855.*

528 **Trianthema crystallina**, *Vahl.; Fl. Br. Ind., II., 660*; FICOIDEÆ.

Syn.—T. TRIQUETRA, *Rottl.*; T. SEDIFOLIA, *Visian.*; POPULARIA CRYSTALLINA, *Forsk.*

Vern.—*Ulettie*, PB.; *Patar phor*, MERWARA; *Kukka* pila kura*, TEL.

* This vernacular name is from **Roxburgh**; **Elliot** doubts its being in reality a synonym for any species of **Trianthema**.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 384; Dalz. & Gibs., Bomb. Fl., 14; Kurz, in Jour. As. Soc., 1877, Pt. ii., 110; Stewart, Pb. Pl., 100; Elliot, Fl. Andhr., 102; Murray, Pl. & Drugs, Sind, 103; Gazetteers:—N.-W. P., IV., lxxii; X., 310; Bombay, V., 23; Rájputana, 36; Ind. Forester, IV., 234; XII., app., 14.*

Habitat.—A prostrate, branched herb, met with throughout India from the Panjáb to Ceylon, except in Bengal; very common in some of the desert tracts of the Panjáb and Rájputána.

The Gada-bani,—a Domestic Medicine. (*J. Murray*) **TRIANTHEMA pentandra.**

Food.—Near Múltán the SEEDS are swept up and eaten, in times of famine (*Edgeworth*). FOOD. Seeds 529

Trianthema decandra, *Linn.; Fl. Br. Ind., II., 661; Wight, Ic., t. 296.* 530

Syn.—ZALEYA DECANDRA, *Burm.*

Vern.—*Gada-bani*, HIND. & BENG.; *Bhis khupra*, DEC.; *Vallai-sharunnai*, TAM.; *Tella galijéru, galijéru*, TEL; *Gaija soppu*, KAN.; *Punarnavi*, SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 385; Dalz. & Gibs., Bomb. Fl., 15; Kurz, in As. Soc. Jour., 1877, Pt. ii., 110; Thwaites, En. Ceyl. Pl., 23; Burm., Fl. Ind., t. 31, f. 3; Elliot, Fl. Andhr., 57, 175; Ainslie, Mat. Ind., II., 371; O'Shaughnessy, Beng. Dispens., 353, 684; Bidie, Prod. S. Ind., 53; Boswell, Man. Nellore, 138; Gazetteers.—Mysore & Coorg, I., 55; N.-W. P., IV., lxxii.*

Habitat.—A diffuse branched herb, native of the Deccan Peninsula and Ceylon.

Medicine.—"The ROOT is aperient and is mentioned in some of the Tamool sastrums as useful in hepatitis, asthma, and suppression of the menses. Four pagodas weight of the BARK of the root made into a decoction, by boiling it in 1lb of water till ½lb remains, will open the bowels" (*Ainslie*). MEDICINE. Root 531 Bark. 532

SPECIAL OPINION.—§ "The root ground up with milk and given internally is said to be a specific in orchitis. The JUICE of the LEAVES dropped into the nostrils relieves one-sided headache" (*Surgeon-Major D. R. Thomson, M.D., C.I.E., Madras*). Juice. 533 Leaves. 534

T. hydaspica, *Edgw.; Fl. Br. Ind., II., 661.*

Syn.—T. POLYSPERMA, *Hochst.*

Reference.—*Murray, Pl. & Drugs, Sind, 108.*

Habitat.—Found in Múltán, Sind, and certain localities of Bombay. 535

Food.—It is said to be eaten as a pot-herb (*Murray*). FOOD. 536

T. monogyna, *Linn.; Fl. Br. Ind., II., 660; Wight, Ic., t. 228.* 537

Syn.—T. OBCORDATA, *Roxb.*; T. PENTANDRA, β OBCORDATA, *DC.*

Vern.—*Swét, sabuni, lal-sabuni*, HIND.; *Bishkápra*, PB.; *Nasurjinghi ke jurr, wurmah*, DEC.; *Khápra, bishkápra, sweta-punarnava*, BOMB.; *Sharunnai, shavalai, kirai*, TAM.; *Galijéru, yerra galijéru, erra galijéru, ambati madu*, TEL.; *Muchchu góni*, KAN.; *Punaravi*, SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 385; Dalz. & Gibs., Bomb. Fl., 14; Kurz, in Jour. As. Soc., 1877, Pt. ii., 110; Elliot, Fl. Andhr., 14, 52, 57; Ainslie, Mat. Ind., II., 370; Dymock, Mat. Med. W. Ind., 2nd Ed., 74; Murray, Pl. & Drugs, Sind, 108; Atkinson, Ec. Prod., N.-W. P., pt. V. (Foods), 91, 95; Boswell, Man. Nellore, 123, 144; Ind. Forester, III., 238; XII., app., 14; Gazetteers.—Mysore & Coorg, I., 55, 70; N.-W. P., IV., lxxii.*

Habitat.—Common throughout India and Ceylon.

Medicine.—Ainslie states that the *Vytians* consider the ROOT cathartic and give it in powder, in the quantity of about two tea-spoonfuls twice daily in combination with ginger. MEDICINE. Root. 538

Food.—The LEAVES and STEMS are eaten as a vegetable. Atkinson writes that they are said sometimes to have poisonous effects, producing paralysis and diarrhœa. FOOD. Leaves. 539 Stems 540

T. pentandra, *Linn.; Fl. Br. Ind., II., 660.* 541

Syn.—T. OBCORDATA, *Wall.*, not of *Roxb.*; T. GOVINDIA, *Wall.*

Vern.—*Bishkápra, itsit, narma*, PB.; *Bishkapra, narwa*, SIND.

References.—*Stewart, Pb. Pl., 100; Murray, Pl. & Drugs, Sind, 108; Lisboa, U. Pl. Bomb., 200; Gazetteers.—N.-W. P., I., 81; IV., lxxii.; X., 310; Ind. Forester, XII., app., 14.*

Habitat.—A common weed in waste ground in the plains of the Panjáb, Sind, and North-West India.

MEDICINE. Plant. 542 Medicine.—The PLANT is considered astringent in abdominal diseases, and is also stated to produce abortion (*Stewart*).

FOOD. 543 Food.—This, like the preceding species, is eaten as a pot-herb in times of scarcity, though stated to be apt to produce diarrhœa and paralysis (*Stewart*).

TRIBULUS, *Linn.; Gen. Pl., I., 264, 988.*

544 **Tribulus alatus,** *Delile; Fl. Br. Ind., I., 423;* ZYGOPHYLLEÆ.

Vern.—*Gokhuri-kalan,* HIND.; *Lotak, bakhra, hasak, gokhrudesi,* PB.; *Kurkundai,* PUSHTU; *Nindo-trikund, trikundri, latak,* SIND.

References.—*Aitchinson, Bot. Afgh. Del. Com., 43; Murray, Pl. & Drugs Sind, 91; Dymock, Mat. Med. W. Ind., 2nd Ed., 120; Dymock, Warden. & Hooper, Pharmacog. Ind., I., 245; Notes on the Ec. Pl., Baluchistan, No. 70; Stocks, Rept. on Sind.*

Habitat.—A prostrate herb, found in Sind and the Panjáb.

MEDICINE. Fruit. 545 Medicine.—The FRUIT is used for the same purposes as those of T. terrestris, *Linn.*

FOOD. Plant. 546 Seeds. 547 Food.—"The young PLANT is in some places eaten as a pot-herb; and the SEEDS are used as food, especially in times of scarcity."

548 **T. terrestris,** *Linn.; Fl. Br. Ind., I., 423; Wight, Ic., t. 98.*

Syn.—T. LANUGINOSUS, *Linn.*

Vern.—*Gókhrú, gokhuru, chota gokhrú, hussuk,* HIND.; *Gokhuru, gokshura, gókhru,* BENG.; *Gakhurá, gokshra,* URIYA; *Rásha, kokullak,* LAD.; *Lotak, bakhra, bhakhra, bhúkri, gokhrú desí, bhakhra,* PB.; *Málkundai, kandalái,* PUSHTU; *Krúnda,* AFG.; *Trikundri, gokhru,* SIND; *Gokhrú,* C. P.; *Lahana gokrú, gokhrú, saraté,* BOMB.; *Ghókaru, charátté, lahana gokharu,* MAR.; *Gókhru, gokharú, míthá gokhru, nhana gokharu,* GUZ.; *Ghókrú,* DEC.; *Nerunji, nerrenji kiray, nerunji-mullu,* TAM.; *Palléru-mullu, chiru-palléru, chiri palléru, palléru,* TEL.; *Negalu,* KAN.; *Neringil, nerinnil,* MALAY.; *Sule-anén, charatte,* BURM.; *Neranchi, neranji,* SING.; *Vanasrangátá, gókhurhá, trikantaka, sthala sringataka, gokshuri, ikshugandhá, súdúmstra, gokshura,* SANS.; *Bastítáj, khasak, busteyrúmí,* ARAB.; *Khâre-khasak, khussuck,* PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 371; Dalz. & Gibs., Bomb. Fl., 45; Stewart, Pb. Pl., 37; Rept. Pl. Coll. Afgh. Del. Com., 43; Sir W. Elliot, Fl. Andhr., 42, 143; Sir W. Jones, Treat. Pl. Ind., V., 134; Burmann, Fl. Zey., 265, t. 106, f. 1; Pharm. Ind., 39; Ainslie, Mat. Ind., II., 247, 248; O'Shaughnessy, Beng. Dispens., 259; Irvine, Mat. Med. Patna, 30; Med. Topog. Ajmir, 135; Moodeen Sheriff, Supp. Pharm. Ind., 247; Mat. Med. S. Ind. (in MSS.), 71; U. C. Dutt, Mat. Med. Hindus, 125, 298; S. Arjun, Cat. Bomb. Drugs, 28; Murray, Pl. & Drugs, Sind, 90; Dymock, Mat. Med. W. Ind., 2nd Ed., 119, 887, 889; Dymock, Warden, & Hooper, Pharmacog. Ind., I., 243; Cat. Baroda Durbar, Col. & Ind. Exhib., No. 177; Year-Book Pharm., 1878, 287; Birdwood, Bomb. Prod., 16; Drury, U. Pl. Ind., 432; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 307; Useful Pl. Bomb. (XXV., Bomb. Gaz.), 196; Econ. Prod. N.-W. P., Pt. V. (Vegetables, Spices, & Fruits), 91, 93; Bidie, Prod. S. Ind., 22; Stocks, Rept. on Sind; Boswell, Man. Nellore, 132; Settlement Reports:—Panjáb, Montgomery, 21; C. P., Chánda, app. vi.; Gazetteers:—Bombay, V., 24; XV., 428; Panjáb, Muzaffargar, 27; Montgomery, 21; Peshawár, 26; Gujrat, 11; N.-W. P., I., 80; IV., lxix.; Orissa, II., 159, 181; Rajputana, 3; Ind. Forester, III., 238; IV., 234; XII., app. 2.*

Habitat.—This low trailing annual plant is common throughout India, ascending to 11,000 feet in Western Tibet, rarer in Lower Bengal, and absent from the vicinity of Calcutta; abundant in Behar and everywhere

throughout the Madras Presidency and the North-Western Provinces and Oudh.

. is used MEDICINE. Plant. 549
ndus as
painful Fruit. 550
It is
one of the ten plants which go to form the *Dasamula kvatha*, a compound decoction often mentioned in Sanskrit works (*U. C. Dutt*). The plant is the τρίβολος of Dioscorides and the *tribulus* of Pliny, in modern Greek
in Cochin China as an
the Peshawar valley, by
mucilaginous by the plant
is drunk as a remedy for impotence, and an infusion of the STEM is administered for gonorrhœa. Mr. Lace informs the writer that the fruit of Stem. 551

two ounces, coriander fruit, two
-half. This quantity was given
her favourite mode of administra-
. and ROOT with rice so Root. 552
ken in large quantities
diuretic, irrespective of
Sheriff describes the
in cases of strangury, Leaves. 553
coction similar to that
above described, and the fresh JUICE of the leaves, in doses of one to three fluid ounces of the former, or one to two fluid ounces of the latter, four or five times a day. Juice. 554

CHEMISTRY. 555

TRADE. 556

fruit has been found very useful as a diuretic in cases of gout, kidney disease, and gravel; also used largely in this part of the country as an aphrodisiac" (*Civil Surgeon F. F. Perry, Jullunder City, Panjáb*)

FOOD. Leaves. 557 Food.—The young LEAVES and STEMS are eaten as a pot-herb; the

Stems. 558
Fruit. 559

TRICHODESMA, *Br.; Gen. Pl., II., 845.*

560 **Trichodesma africanum,** *Br.; Fl. Br. Ind., IV., 154;* BORAGINEÆ.

Syn.—BORAGO AFRICANA, *Linn.;* B. VERRUCOSA, *Forsk.*

Vern.—*Paburpani,* SIND.

References.—*Boiss., Fl. Orient., IV., 280; Murray, Pl. & Drugs Sind, 172.*

Habitat.—A coarse herb, met with in the Panjáb and Sind, distributed to Kábul, Balúchistán, Persia, and Mauritius.

MEDICINE. Leaves. 561 Medicine.—The LEAVES are used as a diuretic (*Murray*).

562 **T. indicum,** *Br.; Fl. Br. Ind., IV., 153; Wight, Ill., t. 172.*

Syn.—T. PERFOLIATUM, *Wall.;* T. HIRSUTUM, *Edgew.;* BORAGO INDICA, *Linn.; ?* B. SPINULOSA, *Roxb.*

Var. subsessilis=T. SUBSESSILIS, *Wall.*

Vern.—*Chhota-kulpha,* HIND.; *Choto-kulpa,* BENG.; *Hetmudia,* SANTAL; *Ratmandi,* KUMAON; *Kallri-búti, ratmandú, nilakrái, andúsi,* leaves= *ratmandi,* PB.; *Ratisurkh, nilakrái,* KASHMIR; *Gaozaban,* SIND; *Lahána kalpa,* MAR.; *Kazuthai-tumbai,* TAM.; *Guvva-gutti,* TEL.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 151; Dalz. & Gibs, Bomb. Fl., 173; Stewart, Pb. Pl., 155; Rev. A. Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 8483; Elliot, Fl. Andhr., 67; Pharm. Ind., 158; Murray, Pl. & Drugs Sind, 172; Baden Powell, Pb. Pr., 366; Drury, U. Pl. Ind., 432; Atkinson, Him. Dist., 314, 752; Bidie, Prod. S. Ind., 35; Off. Corresp. on proposed New Pharm. Ind., 239; Gazetteers:—Mysore & Coorg, I., 63; N.-W. P., I., 83; IV., lxxv.; Ind. Forester, IV., 234; VI., 238; XII., App. 17.*

Habitat.—A coarse hispid herb, found throughout India except in the Bengal plains; also in British Burma.

MEDICINE. Leaves. 563 Medicine.—In the Panjáb the LEAVES are considered cooling and depurative (*Stewart*). In Sind, the Deccan, and South India the drug has a great reputation in the cure of snake-bites, and a case of recovery, after its administration, in the practice of Dr. Maxwell, is on record. There is however, no evidence of its utility, and, like most other remedies of a similar nature, it has probably no virtue. In the Deccan the leaves are used to make an emollient poultice (*Pharm. Ind.*). The Rev. A. Campbell informs us that, in Chutia Nagpur, the ROOT, pounded and made into a

Root. 564 paste, is applied to reduce swelling, particularly of the joints.

565 **T. zeylanicum,** *Br.; Fl. Br. Ind, IV., 154.*

Syn.—BORAGO ZEYLANICA, *Linn.*

Vern.—*Hetenuria,* HIND.; *Tirup-sing,* MANDARI.

References.—*Gazetteers:—Mysore & Coorg, I., 63; N.-W. P., I., 83.*

Habitat.—A common herb in the Deccan Peninsula and Ceylon.

MEDICINE. Leaves. 566 Medicine.—Emollient poultices are made from the LEAVES.

TRICHOLEPIS, *DC.; Gen. Pl. II., 475.*

567 **Tricholepis glaberrima,** *DC.; Fl. Br. Ind., III., 381;* COMPOSITÆ.

Syn.—? SERRATULA INDICA, *Willd.*

Vern.—*Bramhadandi,* MAR.

References.—*Dalz. & Gibs., Bomb. Fl., 131; Dymock, Mat. Med. W. Ind., 2nd Ed., 467.*

Habitat.—A stout annual, native of Central India, Merwara, the Konkan, and the Deccan.

MEDICINE. Plant. 563 Medicine.—This PLANT is believed by the Natives of the region where it occurs to be a nervine tonic and aphrodisiac (*Dymock*).

TRICHOSANTHES, *Linn.; Gen. Pl., I, 821.*

[Tri]chosanthes anguina, *Linn.; Fl. Br. Ind., II., 601;* 569

THE SNAKE GOURD. [CUCURBITACEÆ.

Vern.—*Purwul, cháchenda, chachinga,* HIND; *Chichingá,* BENG; *Chhachhindará,* URIYA; *Jhajhinda,* N.-W. P.; *Chachinga, chachinda,* OUDH; *Chachinda,* KUMAON; *Galar torí, pandol, chichinda,* PB; *Pandolrebhri, kadotri,* SIND; *Pudola,* C. P.; *Pandolu, padval, parwar, padavala, parula,* BOMB; *Padual,* MAR.; *Linga polla., potla, potla kaya, pollo káya, poallkaya,* TEL.; *Padavala káyi,* KAN.; *Pai-len-mwae,* BURM.; *Chichin-da,* SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 694; Voigt, Hort Sub. Cal., 57; Kurz, in Jour. As Soc., 1877, pt ii, 98; Dalz & Gibs., Bomb Fl Suppl., 137; Stewart, Pb. Pl., 99; DC., Orig Cult Pl., 272; Elliot, Fl. Andhr., 107, 155, 156; Mason, Burma & Its People, 470, 747; Ainslie, Mat. Ind., II., 592; O'Shaughnessy, Beng Dispens., 351; U. C. Dutt, Mat Med Hind., 295; Murray, Pl & Drugs, Sind, 39; Atkinson, Him. Dist., 700; Ec Prod., N.-W. P., Pt v, 4; Duthie & Fuller, Field & Garden Crops, Pt ii, 45, t xlvi; Lisboa, U. Pl. Bomb., 157; Birdwood, Bomb Pr., 159; Royle, Ill. Him Bot., 219; Stocks, Rep. on Sind; Madden, Note on Kumaon, 279; Smith, Dic., 381; Kew Off. Guide to the Mus. of Ec Bot., 70; Settle. Reps., Kángra, 25, 28; Chanda, 82; Gazetteers:—Mysore & Coorg, I., 61; II., 11; Bombay, V., 26; VIII, 184; XIII., 294; N.-W. P., I., 81; IV., lxxii.; Orissa, II., 180; Ind. Forester, IX., 201.*

Habitat.—An annual creeper, which probably was originally wild in India or the Indian Archipelago (*DeCandolle*). It has never been found truly wild, and was considered by Mr. C. B. Clarke to be a cultivated state of T. cucumerina, from which it differs only in the fruit.

CULTIVATION.—It is cultivated throughout India as a rainy season crop. Mr. Gollan of the Botanic Gardens, Saháranpur, recommends that two sowings should be made, the first in April, the second in May (*Ind. Forester, IX., 201*). The general treatment and mode of cultivation is the same as that of the cucumber. It is impossible to obtain information as to the extent to which it is grown throughout the country. CULTIVATION. 570

Medicine.—The SEEDS are considered cooling. MEDICINE. Seeds. 571

Food.—The long, cucumber-like FRUIT is cooked and eaten as a vegetable, either boiled or in curries. When ripe it varies in length from 1 to 3 feet, and is of a brilliant orange colour; when young it is prettily striped with white and green. If gathered when very young, less than 4 inches in length, and cut into thin strips, it may be cooked in the same way as French beans, and forms a very fair substitute for that vegetable. FOOD. Fruit. 572

T. cordata, *Roxb.; Fl. Br. Ind., II., 608.* 573

Syn.—T. TUBEROSA, *Roxb.*; T. PALMATA, *Wall. Cat. 6688 F partly, & C.*

Vern.—*Bhoi kúmra, bhúmí kúmara, bha-khúmba, patol,* BENG.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 695; Irvine, Mat. Med. Patna, 15, 67; O'Shaughnessy, Beng. Dispens., 350; Pharm. Ind., 96; Taylor, Topography of Dacca, 55; Drury, U. Pl. Ind., 433.*

Habitat.—An extensive climber, met with at the base of the Eastern Himálaya, from Sikkim to Assam and Pegu; frequent in the Khásia Tarai and Cachar.

Medicine.—The large, tuberous ROOT is considered a valuable tonic, and is employed as a substitute for calumba (*Roxburgh*). Irvine remarks that it is also deobstruent, and that in Patna, the dried FLOWERS are believed to be stimulant in doses of 2 to 5 grains. Taylor states that in Dacca the root, dried and reduced to powder, is given in doses of 10 grains in enlargements of the spleen, liver, and abdominal viscera. The fresh root, mixed with oil, forms a common application for leprous ulcers (*Topog. Dacca*). MEDICINE. Root. 574 Flowers. 575

576 **Trichosanthes cucumerina**, *Linn.; Fl. Br. Ind., II., 609.*

Syn.—T. LACINIOSA, *Klein;* T. PILOSA, BRYONIA UMBELLATA, CUCUMIS MISSIONIS, *Wall.*

Vern.—*Jangli-chi-chóndá,* HIND.; *Ban-chi-changá, ban-patol, ranachapadavali,* BENG.; *Jangli chichinda, patol, ban-patol, kandori,* N.-W. P.; *Jangli-chachinda,* KUMAON; *Gwal kakri, mohakri,* PB.; *Rán parul, jangli-padavala, kadu-padavala, pudoli,* BOMB.; *Ránáchapadavali, kadú padavala, jangli-padavala, perula,* MAR.; *Patola,* GUZ.; *Káttup-pépudal, péy-pudal, pudel,* TAM.; *Adavi-potla, chédu-potla, patólamu, patólas, chéti-potla, chayud pottah chétipotla, chyaapotta,* TEL.; *Bettada-padavala, kiripodla káyi,* KAN.; *Kaippam-patólam, patavalam, pépatolam,* MALAY.; *Tó-pelen-moye, tha-bwot-kha,* BURM.; *Dúmmaala,* SING.; *Patola,* SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 694; Voigt, Hort. Sub. Cal., 57; Kurz, in Jour. As. Soc., 1877, Pt. ii., 98; Thwaites, En. Ceylon Pl., 126; Dalz. & Gibs., Bomb. Fl., 102; Elliot, Fl. Andhr., 12, 35, 37, 146; Mason, Burma & Its People, 470, 747; Ainslie, Mat. Ind., II., 296; O'Shaughnessy, Beng. Dispens., 350; Dymock, Mat. Med. W. Ind., 2nd Ed., 343; Cat. Baroda Durbar, Col. & Ind. Exhib., No. 178; Atkinson, Him. Dist., 310, 700; Ec. Prod., N.-W. P., Pt. v., 3, 4, 5; Drury, U. Pl., 433; Lisboa, U. Pl. Bomb., 158; Royle, Ill. Him. Bot., 219; Bedie, Prod. S. Ind., Paris Exhib., 53; Gazetteers:—Mysore & Coorg, I., 55; Bombay, XV., 435; N.-W. P., I., 81; IV., lxxvi; Boswell, Man. Nellore, 120; Ind Forester, III., 238; Agri.-Horti. Soc. Ind., Trans., VII., 64, 67; Journ. (Old Series), IV., 202.*

Habitat.—An extensive climbing annual, which grows on hedges and bushes; found throughout India and Ceylon.

GUM. 577 Gum.—A gum, said to have been obtained from this plant, was sent from Madras to the Panjáb Exhibition. It is, however, very doubtful if the product in question really was derived from a cucurbitaceous plant. It must in any case be unimportant, since no other reference to it can be found in works on Indian economic subjects.

MEDICINE. Medicine.—The *patola* of Sanskrit writers, a plant which is mentioned by Chakradatta as febrifuge and laxative, is said by Dymock to be referred in Bombay to this species. In Bengal, on the other hand, T. dioica is believed to be the Sanskrit *patola*. However this may be, the species under consideration is supposed to possess several valuable properties. Thus Ainslie writes, "The tender SHOOTS and dried CAPSULES are very bitter and aperient, and are reckoned amongst the stomachic laxative medicines of the Tamools; they are used in infusion to the extent of two ounces twice daily." In South India, at the present day, the SEEDS are considered to be a remedy for disorders of the stomach, antifebrile and anthelmintic; the tender shoots and dried capsules are believed to have the qualities described by Ainslie, and are given in decoction with sugar to assist digestion; the JUICE of the LEAVES is thought to be emetic, that of the ROOT purgative, the STALK in decoction is reputed expectorant (*Drury*). In Bombay, Dymock informs us, the plant has a reputation as a febrifuge, and is given in decoction with ginger, *chiretta*, and honey. "Muhammadan writers describe it as cardiacal, tonic, alterative, antifebrile, and as a useful medicine for boils and intestinal worms." In the Konkan the LEAF-JUICE is rubbed over the liver, or the whole body, in remittent fevers (*Mat. Med. W. Ind.*).

Shoots. 578 Capsules. 579 Seeds. 580 Juice. 581 Leaves. 582 Stalk. 583 Leaf Juice. 584

SPECIAL OPINION.—§ "The juice of the leaves and fruit is useful in cases of congestion of the liver and bilious headache; it also acts as a laxative. The roots act as a powerful cathartic" (*Civil Surgeon J. H. Thornton, B.A., M.B., Monghyr*).

FOOD. Fruit. 585 Food.—"The ripe FRUIT is eaten in stews by the Natives; it is exceedingly bitter, for which it is reckoned the more wholesome" (*Roxb.*).

Trichosanthes dioica, *Rox.b ; Fl. Br. Ind., II., 609.* 586

Vern.—*Parvar, palval, palwal*, HIND ; *Potól*, BENG. ; *Patal*, URIYA ; *Palwal*, PB. ; *Potala*, GUZ. ; *Kombu-pudalai*, TAM ; *Kommu-potla*, TEL. ; *Patólam*, MALAY. ; *Patola, patulika*, SANS

References.—*Roxb., Fl. Ind., Ed. C.B C., 694 ; Stewart, Pb. Pl., 99 ; Elliot, Fl. Andhr., 94 ; Pharm. Ind., 96 ; Ainslie, Mat. Ind., II., 297 ; O'Shaughnessy, Beng. Dispens., 351 ; U. C. Dutt, Mat. Med Hind., 169, 313 ; S. Arjun, Bomb. Drugs, 60 ; Official Corresp. on Proposed New Pharm. Ind., 228 ; Ec Prod., N.-W. P., Pt. V., 4, 12 ; Drury, U. Pl., 433 ; Ind. Gard., 226 ; W. W. Hunter, Orissa, II., 160 ; Gazetteer, N.-W. P., IV., lxxii.*

Habitat.—An extensive climber, common throughout the plains of Northern India, from the Panjáb to Assam and Eastern Bengal. It is extensively cultivated during the rains throughout the above-mentioned localities, in the same way as other gourds.

MEDICINE: Leaves. 587 Juice. 588 Fruit. 589 Root. 590 Leaf Juice. 591 Tops 592 Plant 593

Medicine.—The LEAVES, the fresh JUICE of the FRUIT, and the ROOT are all used medicinally. The leaves are described as a good, light, and agreeable, bitter tonic. The tender TOPS are regarded as tonic and febrifuge. The fresh juice of the unripe fruit is often used as a cooling and laxative adjunct to alterative medicines. The root is classified amongst purgatives by **Susruta**. In bilious fever a decoction of *patola* leaves and coriander in equal parts is given as a febrifuge and laxative. The fresh LEAF-JUICE is recommended by several writers as an application to bald patches (*Hindu Materia Medica*). An alcoholic extract of the unripe fruit is said to be a powerful and safe cathartic. According to **Rai Kani Lal De Bahadur**, "the bulbous part of the root is a hydragogue cathartic, operating in the same way as Elaterium, for which it can be substituted." He describes the PLANT itself as a wholesome, bitter, and useful tonic **Dr Bowser**, from personal trials, describes it as a febrifuge and tonic. The old Hindu physicians placed much confidence in it in the treatment of leprosy (*Pharm. Ind.*).

SPECIAL OPINIONS.—§ "The leaves of *putwal* or *potol* are bitter and possess tonic properties. They are generally fried with flour paste in *ghí* and eaten. The fruit is an excellent vegetable, which agrees well with convalescents, even from bowel complaints. It is largely consumed as food. The conserve of the fruit is nice food for convalescents, and can easily be prepared" (*Surgeon R. L. Dutt, M.D., Pabna*). "The root is a drastic purgative, useful in dropsy" (*Assistant Surgeon S. C. Bhattacharji, Chanda*).

FOOD. Fruit. 594 Tops. 595

Food.—The FRUIT is oblong, smooth, green when young, and yellow or orange when ripe. When unripe it is much used by Natives as a vegetable, being considered very wholesome, and specially suited for convalescents. The tender TOPS are also eaten as a pot-herb. By Europeans the tender fruit is valued as one of the most palatable of gourds. It is generally prepared in the following ways:—(*a*) Cut in half, boiled and served as a vegetable with butter, salt, and pepper; (*b*) cut in half and fried, (*c*) cut in slices and stewed in sauce; (*d*) cut in half and preserved in syrup with cinnamon and vanilla.

T. lobata, *Roxb.; Fl. Br. Ind., II., 610.* 596

Vern.—*Bun-chichinga*, BENG. ; *Ban-chachinga, Jangli-chichinda*, N.-W. P.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 694 ; Atkinson, Ec. Prod. N.-W. P., Pt. V., 3, 4, 5.*

Habitat.—Found in hedges and among bushes in the Deccan Peninsula; probably a variety of T. cucumerina.

FOOD. Fruit. 597

Food.—It flowers during the rains and produces an oblong, acute FRUIT, which, however, is apparently not eaten. Atkinson remarks that the

reason of this is not evident, since it appears to be as edible as the other species.

598 **Trichosanthes nervifolia,** *Linn.; Fl. Br. Ind., II., 609.*

Syn.—T. CUSPIDATA, *Lamk.*

Vern.—*Parvar, palval,* HIND.; *Potôl,* BENG.; *Kombu-pudalai,* TAM.; *Kommu-potla,* TEL.; *Podla kâyi,* KAN.; *Patôlam,* MALAY.

References.—*Rheede, Hort. Mal., t. 16, 17; Pharm. Ind., 96; Moodeen Sheriff, Supp. Pharm. Ind., 248; Gazetteer, Mysore & Coorg, I., 55.*

Habitat.—A native of the Deccan Peninsula and Ceylon.

MEDICINE. Medicine.—Medicinal properties similar to T. dioica, *Roxb.*

599 600 **T. palmata,** *Roxb.; Fl. Br. Ind., II., 606; Wight, Ill., t. 104, 105.*

Syn.—T. LACINIOSA, *Wall.;* T. ASPERA, *Heyne;* T. TRICUSPIS, *Miq.;* T. BRACTEATA, *Kurz;* CUCURBITA MELOPEPO, & BRYONIA PALMATA, *Wall.*

Vern.—*Lâl-indrâyan, indrâyan mâkâl,* HIND.; *Mâkal,* BENG.; *Indrâyan, parwar, palwal, makâll, Lâl-indrâyan,* N.-W. P.; *Indrâyan,* KUMAON; *Kaundal,* BOMB.; *Kavandala,* MAR.; *Lâl-indrâyan, gâdâpandâ, koundâl,* DEC.; *Korattai, shavari-pasham, ancoruthai,* TAM.; *Avagâda-pandu, dbuvva, kâki donda, âbûha, donda, âgûba, avvagûda, avadula,* TEL.; *Avagude-hannu,* KAN.; *Titta-hondala,* SING.; *Mahâkâla,* SANS., *Anbaghôl, hanzale-ahmar,* ARAB.; *Hanzale-surkh,* PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 695; Kurz, in Jour. As Soc., 1877, Pt. ii., 99; Thwaites, En. Ceylon Pl., 126; Dalz. & Gibs., Bomb. Fl., 103; Elliot, Fl. Andhr., 10, 18, 27, 77; Pharm. Ind., 96; Ainslie, Mat. Ind., II., Ind., 85; O'Shaughnessy, Beng. Dispens., 349; Moodeen Sheriff, Supp. Pharm. Ind., 248; U. C. Dutt, Mat. Med. Hind., 308; Dymock, Mat. Med. W. Ind., 2nd Ed., 345; S. Arjun, Bomb. Drugs, 60; Irvine, Mat. Med. Patna, 71; Official Corresp. on Proposed New Pharm. Ind., 239; Bidie, Prod. S. Ind., Paris Exh., 30; Atkinson, Him. Dist., 310, 699, 752; Ec. Prod. N.-W. P., Pt. v., 4; Drury, U. Pl., 433; Birdwood, Bomb. Pr., 37; Gazetteers:—Mysore & Coorg, I., 61; N.-W. P., I., 81; IV., lxxii; Boswell, Man. Nellore, 118, 125.*

Habitat.—A very large climber, common in all moist thickets from the Himâlaya to Ceylon and Singapore, ascending hills to the altitude of 5,000 feet.

MEDICINE. Fruit. 601 Medicine.—Ainslie informs us that the FRUIT, pounded small, and intimately blended with warm cocoa-nut oil, is considered a valuable application for cleaning and healing "those offensive sores which sometimes take place inside the ears. The same preparation is supposed to be a useful remedy, poured up the nostrils in cases of ozæna." The ROOT is described

Root. 602 by Wight as useful in inflammation of the lungs in cattle. O'Shaughnessy was induced by the singularly bitter taste of the rind to make experiments with a view to ascertaining whether it possessed purgative, tonic, or aperient properties, but given in three-grain doses, thrice daily, it was found to produce no sensible effect (*Beng. Dispens.*). Dymock states that Natives in Bombay sometimes smoke the fruit as a remedy for asthma. The root, with an equal portion of colocynth root, is rubbed into a paste and applied to carbuncles; combined with equal portions of the three myrobalans and turmeric, it affords an infusion which, when flavoured with honey, is given in gonorrhœa (*Mat. Med. W. Ind.*).

SPECIAL OPINION.—§ "The juice of the fruit or the root-bark, boiled with gingelly oil, is used with good effect as a bath oil for the relief of long standing or recurrent attacks of headache" (*Surgeon-Major W. R. Thompson, C.I.E., Madras*).

Food.—The bright-red FRUIT of the wild plant is not eatable, owing to its severely drastic properties, but, under cultivation, the fruit becomes a wholesome vegetable when well boiled. At the Cape of Good Hope its poisonous properties appeared to be removed by pickling (*Jour. Agri.-Horti. Soc., X (Old Series), 3*). FOOD. Fruit. 603

Domestic and Sacred.—The poisonous FRUIT is said to be occasionally mixed with rice and thus employed to destroy crows (*Roxburgh*). It is used by the Hindus of Western India as an ear-ornament for their idol *Ganpatti*, who is dressed up and seated in state in every Hindu house once a year, to bring good luck to the inmates (*Dymock*). DOMESTIC. Fruit. 604

TRIFOLIUM, *Linn.; Gen. Pl., I., 487.*

Trifolium fragiferum, *Linn.; Fl. Br. Ind., II., 86;* LEGUMINOSÆ. 605

STRAWBERRY-HEADED CLOVER.

Vern.—*Chit-batto*, KASHMIR.

Habitat.—Confined to Temperate Kashmír, and much like T. repens.

Fodder.—Eaten by cattle. This plant receives its English name from fruit-like appearance of its calyces, which expand and take on a reddish colour after the flowers fade. FODDER. 606

T. pratense, *Linn.; Fl. Br. Ind., II., 86.* 607

RED OF BROAD-LEAVED CLOVER OF COW-GRASS.

Vern.—*Trepatra, chit-batto*, PB.

References.—*DC, Orig. Cult. Pl., 105; Stewart, Pb. Pl., 76, Year-Book Pharm., 1873, 842; Atkinson, Him. Dist., 308.*

Garhwál at altitudes of 4,000 to

forage clovers in the above-men- FODDER. 608

[illegible] cropper where the commoner clover fails.

T. repens, *Linn.; Fl. Br. Ind., II., 86.* 609

WHITE OF DUTCH CLOVER.

Vern.—*Shaftal, shotul*, PB.; *Ghurg*, PUSHTU.

References.—*Aitchison, Bot. Afgh. Del. Com., 48, Stewart, Pb. Pl., 76, Lace, Quetta Pl., in MS.; Atkinson, Him. Dist., 308; Gazetteer, Mysore & Coorg, I, 59; Agri.-Horti. Soc. Ind., Jour. (Old Series), XIV., 12.*

[illegible] On the Himálaya unfortunately, however, it has the evil reputation of readily causing salivation. [The writer has seen several horses suffering very badly and one that died; in each case the attendants were confident that this was due to their having eaten the wild white clover.—*Ed., Dict. Econ. Prod.*] FODDER. 610

TRIGONELLA, *Linn.; Gen. Pl., I., 486.* 611

A genus of annual herbs which comprises some fifty species, of which eight are met with in India. The FENUGREEK is the only indigenous species of

any importance, though some of the other species might doubtless be utilised as fodder. The small crescent-shaped pods of an Asiatic, though non-Indian, member of the genus, T. uncata, *Boiss.*, is imported into Bombay from the Persian Gulf, under the name of *iklil-el-malik*, for medicinal purposes (see *Pharmacog. Ind.*, *I.*, *404*).

612 **Trigonella Fœnum-græcum**, *Linn.*; *Fl. Br. Ind.*, *II.*, *87*; LEGUMINOSÆ.

THE FENUGREEK OF FENUGRÆC.

Vern.—*Méthi, múthi*, HIND.; *Méthi, methi-shak, methika, hænugreeb*, BENG.; *Methi, methun, methri*, PB.; *Shamli*, AFG.; *Mathi, mitha*, SIND; *Méthi, methini, bhaji*, GUZ.; *Vendayam, ventayam*, TAM.; *Mentulu, menti kúra*, TEL.; *Ménthyá, mente soffu, mente-palle, mente*, KAN.; *Uluva, ventayam, venthiam*, MALAY.; *Pe-nán-ta-zi*, BURM.; *Uluva*, SING.; *Méthi, methiká*, SANS.; *Hulbah*, ARAB.; *Shanbalid, shamlit, shamliz, shamlid*, PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 588; Stewart, Pb. Pl., 77; DC., Orig. Cult. Pl., 112; Sir W. Elliot, Fl. Andhr., 115; Flück. & Hanb., Pharmacog., 172; Fleming, Med. Pl. & Drugs (Asiatic Reser., XI), 183; Ainslie, Mat. Ind., I., 130; O'Shaughnessy, Beng. Dispens., 291; Irvine, Mat. Med. Patna, 66; Medical Topog., Ajm., 145; U. C. Dutt, Mat. Med. Hind., 141, 309; S. Arjun, Cat. Bomb. Drugs, 44; Murray, Pl. & Drugs, Sind., 113; Bent. & Trim., Med. Pl., 71; Dymock, Mat. Med. W. Ind., 2nd Ed., 209; Cat. Baroda Durbar, Col. & Ind. Exhb., No. 179; Year-Book Pharm., 1874, 624; Trans. Med. & Phys. Soc., Bomb. (New Series), No. vi., 1860, 330; Birdwood, Bomb. Prod., 31, 148, 220; Baden Powell, Pb. Pr., 151, 245; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 308, 708, 752; Useful Pl. Bomb. (XXV., Bomb. Gaz.), 151, 217; Econ. Prod. N.-W. Prov., Pt. V. (Vegetables, Spices, and Fruits), 13, 15, 37, 40; Stock's Rep. on Sind; Nicholson, Man. Coimbatore, 224; Morris, Descriptive & Historical Acct., Godavery, 68; Bombay, Man. Rev. Accts., 102, 103; Madden, Note on Kumaon, 280; Settlement Rept.:—Panjáb, Jhang, 90, 91; N.-W. P., Kumaon, App., 33; Gazetteers:—Panjáb, Karnal, 172; N.-W. P., I., 80; IV., lxx.; Orissa, II., 27 134, 180; Mysore & Coorg, II., 55, 59; II., 11.*

Habitat.—A robust, annual herb, wild in Kashmír, the Panjáb, and the Upper Gangetic plain, widely cultivated in many parts of India, particularly in the higher inland provinces.

CULTIVATION 613 CULTIVATION.—No particulars can be given of the annual area under the crop, except in the cases of Bombay and Madras, the former of which had, in 1888-89, 1,358 acres, and the latter 257 acres, under Fenugreek. It is, however, of considerable importance in other parts of India, especially in the Panjáb. The following may be accepted as typical of the method of cultivation:—It is grown near wells and *sailáb* lands. On the former it is generally sown after cotton, sometimes after *juár*, rarely on uncropped ground. The seed, about 30lb to the acre, is scattered broadcast in the month of February, is trampled into the ground, and watered. It seldom fails to germinate, and after the leaf appears requires no care beyond five or six further waterings. A top-dressing is often given. The crop is ready to cut in April. On *sailáb* lands it is sown in the end of October or beginning of November, good new alluvium or rich old clayey loam being generally selected. After one or two ploughings the seed is scattered broadcast and ploughed lightly in. The crop ripens about the same time as that on well lands (*Settlement Report, Jhang District*).

DYE. Seed. 614 **Dye.**—The SEED yields a yellow dye, and enters into the composition of an imitation of carmine. The yellow decoction produces a fine permanent green with sulphate of copper.

MEDICINE. Seeds. 615 Plant. 616 Leaves. 617 Flour. 618 Oil. 619

The flour of the seeds is used as a poultice, and is applied to the

In European medicine, fenugreek at one time enjoyed as high a reputation as it now holds in Hindu and Muhammadan Materia Medica. It is the "*Fænum Græcum*" of Latin writers, the τῆλις of Dioscorides and other Greek authors. Its mucilaginous seeds, "siliquæ" of the Roman peasants, were valued as a food and supposed to possess many

pharmacy.

the testa contain tannin, the Chemistry. 620
o sugar. The air-dried seeds
d on subsequent incineration
a fourth is phosphoric acid
per cent. of a fœtid fatty oil
having a bitter taste. Amylic alcohol removes a small quantity of resin; alcohol, added to a concentrated aqueous extract, precipitates mucilage, which amounts when dried to 28 per cent. The percentage of nitrogen

has a weak saline taste.

ne Trade. 621
a. Seed. 622
10
n
o

in cases of contusion" (*Hospital Assistant Lal Mahomed, Hoshangabad, Central Provinces*).

FOOD & FODDER. Leaves. 623 Seeds. 624 Pods. 625 Plant. 626 Food and Fodder.—The LEAVES, especially when young, are largely employed as a vegetable in India. They are boiled and afterwards fried in *ghi*; the taste is bitter and very disagreeable to Europeans. The SEEDS are chiefly used as a condiment to flavour curries made of rice, pulse, flour, and meat, or as a relish with unleavened bread. They have an unpleasant odour, with an unctuous, farinaceous taste, accompanied by considerable bitterness. The young PODS are eaten as a vegetable, being generally cooked by simply boiling in water. The PLANT is a valuable fodder, though believed to be heating and lactifuge. The seeds form an important constituent of many cattle foods, and are used to render musty hay and compressed fodder palatable. They are said to be also employed as an adulterant of, and substitute for, coffee.

627 **Trigonella occulta,** *Delile; Fl. Br. Ind., II., 87.*

Syn.—T. ARGUTA, *Visiani.*

References.—*Boiss., Fl. Orient., II., 84; Murray, Pl. & Drugs, Sind, 113.*

Habitat.—A diffuse, densely cæspitose annual, found in the plains of Sind and the Upper Gangetic plain near Lucknow; distributed to Egypt and Nubia.

MEDICINE. Seeds. 628 Medicine.—In Sind, the SEEDS are used in dysenteric affections (*Murray*).

FOOD. Plant. 629 Pods. 630 Food.—"The fresh-gathered PLANT and PODS are eaten as a pot-herb" (*Murray*).

Trepe de Roche, see Lichens, Vol. IV., 638.

TRIPHASIA, *Lour.; Gen. Pl. I., 303.*

631 **Triphasia trifoliata,** *DC.; Fl. Br Ind., I., 507;* RUTACEÆ.

Syn.—T. AURANTIOLA, *Lour.;* LIMONIA TRIFOLIATA, *Linn.;* L. DIACANTHA, *DC.*

Vern.—*Chini naranghi,* HIND.

References.—*Dalz. & Gibs., Bomb. Fl. Supp., 12; Kurz, For. Fl. Burm., I., 192; Gamble, Man. Timb., 59; Burm., Fl. Ind., t. 35, f. 1; Mason, Burma & Its People, 453, 759; Kew Bulletin, 1889, 22; Lisboa, Useful Pl. Bomb., 149.*

Habitat.—Common as an escape in the Western Peninsula and in gardens throughout India. It is a native of China, but has been introduced into India for many years.

FOOD. Fruit. 632 Food.—The FRUIT is eaten in Southern and Western India, and is frequently used in conserves and pickles. It is a very common ingredient of Chinese preserved fruits.

633

TRITICUM, *Linn.; Gen. Pl, III., 1204.*

A genus of annual or biennial grasses, erect, with flattened leaves, terminal, cylindrical, or elongated spikes, and a flexuous rachis, alternately hollowed for the reception of the spikelets, continuous or rarely jointed. According to **Bentham & Hooker**, the genus includes the two old genera, **Crithodium**, *Link*, and **Ægilops**, *Linn.*, and comprises in all some ten species, natives of the Mediterranean region and of Western Asia. Of these the only species of economic importance belong to the section of **Triticum** proper, or

Triticum sativum, *Lamk.;* GRAMINEÆ. 634

WHEAT, *Eng.;* FROMENT, *Fr.;* WEIZEN, *Germ.*

Hæckel recognises three principal races, namely, *a*, spelta, *β*, dicoccum, and *γ*, tenax.

Syn.—T. VULGARE, *Villars.;* T. HYBERNUM & T. ÆSTIVUM, *Linn.;* T. TURGIDUM, *Linn.;* T. COMPOSITUM, *Linn.;* T. COMPACTUM, *Heer,* T. DURUM, *Desf.;* T. DICOCRUM, *Schronk.;* T. AMYLEUM, *Seringe,* T. SPELTA, *Linn.*

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though
sometimes applied to this grain more correctly denotes barley) (U). C

known.—*Ed., Dict. Econ. Prod.*), SANS.; *Hintah, burr,* ARAB.; *Gandum,* PERS.

(1889), 76-79, 105; (Statistical Returns), 5, 7, 9, 70, 72; Bomb. Man. Rev. Accts., 101; Bengal Admin. Rep. (1889), Pt. I., 27, 28; Pt. II., 12, 106, 107, 115, 122, 136, 138, 146, 147, 163, 165; British Burma, Rep. on Inland Trade (1884-85), App. ii., 4; British Burma, Rep. on Trade & Navigation (1884-85), 9; Settlement Reports:—N.-W. P., Kumaon, App. 32; Central Provinces:—Baitool, 77; Chanda, 81, 84, 96, 98; Damoh, 87; Jubbulpore, 86; Hoshungabad, 277, 287; Mundlah, 46; Nagpore, 273; Nimar, 196; Nursingpur, 53; Saugor, 98; N. Godavery, 35; Wurdah, 65-67; Port Blair (1870-71), 27; Gazetteers:—Panjáb, Karnal, 172; N.-W. P., I., 86; Central Provinces, 18, 114, 385, 471, 501, 516; Sind, 306; Burma, I., 465; Mysore & Coorg, I., 68; Rajputana, 96, 128, 254, 255, 279; Ulwar, 87, 89, 127, 166; Annual Reports of Dirs. Land Rev. and Agri. in many passages; Reports of Chambers of Commerce, Bombay, Calcutta, Karachi; Proceedings of the Govt. of India, Rev. & Agri. Depts., in many passages, Watt, on the conditions of wheat growing in India, Jour. Royal Agri. Soc. Eng., XXIV., 8; Watt, The Trade of India and its Future Development, Pro. Royal Col. Inst. XVIII., 45, 60, 68; Agri.-Horti. Soc. Ind.:—Trans., I., 19, 24, 27, 28, 166, 195, 197, 201, 207; II., 157, 190; III., 83, 90, 187; IV., 82-85, 88, 91, 99, 102, 107, 117, 118, 124, 144, 145, 150; V., 63, 68; VI., 74, 75; VIII., 94, 95, 171, 419; Jour., I., 142-145, 158, 165, 335; II. Pt. I., 257; Pt. II., 176, 177, 256, 259, 267, 293, 409, 410, 442, 447, 448; 450, 480, 537-539, 547, 592; III., 94, 98, Sel., 193, 194, 249; IV., Pt. I., 120; Pt. II., 29, 47, Pro. xxiii.-xxv., xlix.; V., Pt. I., 135, 136; VI., 148; VII., Pt. II., 1, 2; VIII., 57; XIV; 133; New Series, I., Pro. xxxii., xxxiii; III., Sel. 34, 35; VI., Pro. 26; VIII., 79, 80, 82, 173, 178; Bear The Indian Wheat Trade, Jour. Royal, Agri. Soc. Eng., XXIV., 50; Indian Agriculturist, 1886, 1887, 1889, 1890; Rev. & Agri. Dept., Notes on Wheat, 1885, 1889; Basu, Rep. Agri., Lohardaga Dist., Pt. I., 50, 152; Pt. II., 24, 30-32, 53, 54, 61, 72, 74; Clifford Richardson, Investigation of the Composition of American Wheat and Corn; Report on the Distribution and Consumption of Wheat, 1885, 1888; Report, Impurities in Indian Wheats, 1888-1889; Report Nagpore Experimental Farm, 1884-85; Encyclop. Brit., XXIV., 531; Balfour, Cyclop. Ind. 1069; Morton, Cycl. Agri., II., 1004, 1127-1155; Smith, Econ. Dict., 438.

HISTORY. 635 **Habitat & History of Wheat.**—The question of the original habitat of wheat, and of the origin and history of its widespread cultivation, has been dealt with very elaborately by **M. A. deCandolle** in his valuable work on the *Origin of Cultivated Plants*. He adduces numerous arguments in support of the opinion that the cultivation is prehistoric in the Old World. "Very ancient Egyptian monuments, he says, older than the invasion of the shepherds and the Hebrew Scriptures, show otherwise this cultivation already established, and when the Egyptians or Greeks speak of its origin, they attribute it to mythical personages—Isis, Ceres, Triptolemus." A small-grained wheat has been found at the earliest lake-dwellings of Western Switzerland, the inhabitants of which were at least contemporary with the Trojan war, and perhaps earlier. The same form, the **T. vulgare antiquorum** of Heer, was found by **Unger** in a brick of the pyramid of Dashur in Egypt, to which he assigns a date of 3359 B.C. Another small-grained race, **T. vulgare compactum muticum**, *Heer*, was less common in Switzerland in the earliest stone age, while a third intermediate form was cultivated in Hungary at the same period. From philological data, combined with the absence of authentic records of wild wheat, **DeCandolle** believes that the culture of the plant in the temperate parts of Europe, Asia, and Africa is probably older than the most ancient known languages The Chinese certainly grew it 2700 B.C., and considered it a gift direct from heaven. In the annual ceremony of sowing five kinds of seed, instituted by the Emperor Shen-nung or Chin-nong, wheat was one of the species employed. After carefully considering all available information, **DeCandolle** concludes that the original home of the species in very early prehistoric times was in Mesopotamia, where it is

TRITICUM sativum

HISTORY.

said by **Berosus**, the earliest of all Western Historians, and a Chaldean
priest who wrote some twenty-three centuries ago, to have occurred wild.
"The area," writes **DeCandolle**, "may have extended towards Syria, as
the climate is very similar; but to the east and west of Western Asia, as
has probably never existed but as a cultivated plant, anterior, it is
true, to all known civilization" Spelt is considered by the same author
to be a distinct species, which is said to have probably had its origin
in eastern temperate Europe and the neighbouring countries of Asia
This presumption is, however, based entirely on doubtful historical and
philological data, the latter of which are certainly faulty He remarks
that spelt has no name in Sanskrit, nor in any modern Indian language,
a statement that was shown by **Dr. Watt**, in dealing with the wheats of
Bombay, to be erroneous. Spelt has been cultivated from an uncertain
date in many localities of India, and bears distinct vernacular names,
which are always applied to it and never to the commoner races of wheat
It is interesting to notice that support is given by **Olivier** to **Hæckel's**
reduction of spelt to **T. sativum**, an authority, whose testimony, regarding
the indigenous area of the latter species, is accepted by **DeCandolle.**
Olivier writes that he several times found spelt in Mesopotamia, in par-
ticular upon the right bank of the Euphrates, north of Anah, in places
unfit for cultivation It is thus at least possible that spelt, if not distinct,
may at very early times have become differentiated from ordinary wheat,
in the original home of both, and that the seed of both forms may have
spread together, giving rise to the irregular appearance of the former as a
cultivated plant in many parts of the world. [But there is still another con-
sideration. In addition to the testimony of **Berosus**, **DeCandolle** accepts
that of **Strabo** as of some weight in any attempt to determine the origin of
wheat. **Strabo** was born 50 B C., and he affirmed, on the authority of
Aristobulus, that a grain very similar to wheat grew wild upon the banks
of the Indus. **U. C. Dutt** tells us that one of the wheats spoken of by
Sanskrit writers was regarded as indigenous, while another was beard-
less There is thus very nearly as strong presumptive evidence in favour
of India being the home of some of the forms of wheat as can be shown for
any other part of the globe. There is sufficient, at all events, to justify the
reprehension of any arbitrary affirmation in favour of one country more
than another. India possesses perhaps as comprehensive a series of time-
honoured forms of wheat as can be shown for any other country. It has
its hard wheats and soft wheats; its starch wheats and spelt wheats; its
bearded and beardless wheats. It can also be abundantly demonstrated
that most of these have been grown for countless ages on very nearly the
same fields as they are to be found at the present day. Even were it
demonstrated that the Indus Valley wild grain, mentioned by **Strabo**,
was the wild rice which exists there now, the position here urged would not,
in the least, be affected, namely, that wheat cultivation in India is as
ancient as in Europe or any other part of the world. Its origin is, how-
ever, involved in an obscurity even more impenetrable than that which en-
velopes the historic records of the wheat cultivation in other parts of the
world. It must, however, be remembered, in discussing the question of
the origin of this anciently cultivated cereal, that it is very nearly impos-
sible, whatever the original home of wheat may have been, to determine with
accuracy the character of the first parent from which it was derived. But
DeCandolle's concluding remark regarding the wheats found in associa-
tion with the remains of the lake dwellers of Switzerland and Italy is there-
fore significant, *viz*, that "None of these is identical with the wheat now
cultivated, as more profitable varieties have taken their place." *Ed.*, *Dict.*
Econ. Prod.]

WHEAT AREA. 636

REVIEW OF THE AREA UNDER WHEAT.

The wheat area of the Indian Empire has been described by Dr. Forbes Watson, in his *Report on Indian Wheat (1879)*, as embracing the whole of Northern India up to the Gangetic Delta, and, in Southern India, the whole of the table-land above the Gháts. The crop is cultivated in all districts of Sind, the Panjáb, the North-West Provinces and Oudh. The true wheat-growing region of Bengal is the valley of the Ganges, though in several other parts of the province the cereal is cultivated to a small extent for local consumption. In Assam no wheat is grown for exportation. In Lower Burma there is a trifling area under the crop, but the soil and climate of Upper Burma are extremely well suited to wheat, and this province may in the future attain an important position in this respect. In Bombay the cultivation is general, except in Thana, Kolába, Ratnagíri, and Kánara. In Madras it is grown in Cuddapah, Bellary, Karnul, Coimbatore, and the Nilghíris, also to a small extent in the coast district of Kistna. Wheat is also grown in nearly every part of Mysore, throughout Berar, and in all parts of the Central Provinces except Sambulpur; in Coorg it is not cultivated, but in Ajmír a considerable acreage is under the crop. Thus, excluding the coasts of the peninsula and of the north and east of the Bay of Bengal, it may be said that all the territories of British India, except Assam and Burma, contribute to the wheat supply of the country.

Increase. 637 The increase of the area under wheat in India, and of the importance of the country amongst the wheat-suppliers of the world, has been very rapid during the past twenty years. This fact has naturally attracted much attention, not always of a friendly nature, and has given rise to much controversy as to the actual cause. Thus, at no more remote date than 1887, the Statistician of the Department of Agriculture, Washington, in an official report, went the length of discrediting the statement of the Government of India that there had been such an increase; but in 1888 he had to admit that an increase had occurred, though he made it out to be but small in amount. It has also been urged from other quarters that the increase in area shown by agricultural reports must necessarily entail a diminution in the cultivation of other non-exported food-crops and thus have led to a decrease in the food-supply of the people; but this has been shown again and again not to be the case. Dr. Watt, in a lecture on the *Trade of India and its Future Development*, read before the Royal Colonial Institute in 1886, says:—"With reference to the remarkable modern export trade in wheat it is customary to hear the most absurd and misleading statements made in public. It is, for example, not uncommonly urged that the trade will decline as rapidly as it has come into existence. It has been pronounced forced and unnatural, the accumulated surplus of food which used to be held by the people against a season of scarcity being now sold. Such an opinion is opposed to all the facts which have the least bearing on the case. In the first place, with the single exception of the Panjáb, wheat has never been a staple food with the people of India. In the second place, far from the area formerly occupied by the food-stuffs of the poor (millets and pulses) having been displaced by wheat cultivation, it has been greatly extended. Last year, for example, there were 58,565,331 acres under rice, 48,000,000 under pulses, 33,228,867 under millets, and 20,328,254 under wheat. Returns have been called for over the length and breadth of India, and it has been conclusively shown that had the wheat cultivation remained at what it was twenty years ago, the increased cultivation of rice, pulses, and millets would alone have proved sufficient to feed the greatly enhanced popu-

lation. Wheat has been grown on the lands suitable for it because it has proved remunerative, but were circumstances outside the limits of India to arise that would lessen the profits on wheat, other crops would be substituted for it. Nothing could be more clearly demonstrated than this fact, for an exceptionally good harvest in Europe and America is at once followed by a lessened cultivation of wheat in India. If wheat has displaced any crop more than another, it has been cotton, and few Natives would be so far lost as to cultivate the millets upon rich wheat soil. Their best lands have always been devoted to remunerative crops for the export trade. But, if further proof were needed that the fields formerly devoted *to the supply of necessary food have not been taken by wheat, it can be* had in the fact that, coincident with the great success of the wheat trade of India, the areas under oil-seeds and cotton have also greatly extended. But the necessity for such explanations is not difficult to find. The wheat trade has had a much more immediate effect upon the established industries of Europe and America, and has, therefore, attracted more attention; but the development of the oil-seed trade has been quite as rapid as that of wheat. During the past five years, for example, it has increased 78½ per cent. in quantity and 69½ per cent. in value.

WHEAT AREA.

Increase.

"But still a third series of facts proves that the wheat trade of India is a perfectly good and natural one. Were it the case that the surplus wheat of the working classes was being removed from India, the prices of other food-stuffs would be expected to show a distinct rise. The most careful record ... ct of India for every ... areful scrutiny those ... which bears a most r ... Dr.
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fore, of the enormous exports which have taken place during the past ten or fifteen years, the local price has remained stationary, or, in some districts, has actually become cheaper. Surely this does not, by any manner of means, justify the statements one often hears made, that the surplus food of the people of India is being drawn out of it through the greed for money of certain members of the Indian community." The

under the crop, but this area is approximate only, as there are no statistics. In Madras the area is small and fluctuates little, the normal is taken at 27,000 acres. Ajmere is supposed to have a normal area of 15,000 acres, and, as already stated, Burma, Assam, and Coorg are not wheat-growing countries to any note-worthy extent. For the purposes of comparison as to increase in area it is therefore advisable to con-

TRITICUM sativum.

Indian Area under

WHEAT AREA.

Increase.

sider only the remaining provinces, which are the chief wheat-producers:—

Table shewing the areas in the chief wheat-producing provinces during the quinquennial periods ending 1877-78, 1882-83, and 1887-88, also actuals in 1888-89, and the estimated forecast for 1889-90.

Conf. with pp.

Provinces.	Quinquennial period ending 1877-78.	Quinquennial period ending 1882-83.	Quinquennial period ending 1887-88.	Actuals, 1888-89.	Estimates, 1889-90.§
	Acres.	Acres.	Acres.	Acres.	Acres.
135. North-West Provinces	3,734,000*	3,773,000	3,814,000	3,479,279	4,490,600 (North-West Provinces and Oudh)
123. Oudh	931,000*	1,2[illegible]	1,507,000	1,489,921	
Panjab	[illegible]	6,7[illegible]	7,043,000	7,371,977†	6,222,900
121. Central Provinces	3,8[illegible]	3,4[illegible]	4,002,000	3,531,911	4,085,910
132. Bombay — British Districts	912,000	1,42[illegible]	2,033,000	2,078,447	1,378,110
Bombay — Native States	521,000*	521,000*	521,000	601,000	551,000‡
126. Sind — British Districts	273,000	297,000	227,000	234,483	411,000
Sind — Native States	35,000*	35,000*	35,000	32,000	...
134. Berar	595,000	631,000	917,000	942,023	830,000
TOTAL	17,1[illegible]	18,323,000	20,169,000	19,761,077	17,952,400

Central India. p. 133. Bengal. p. 157. Hyderabad, Mysore, Kashmir. p. 164. Assam, Burma. p. 160.

The above table exhibits the increase of area during the past sixteen years in the chief wheat-growing provinces of British India, for which alone statistics are available for such a lengthy period. But a nearer approximation of the actual area may be arrived at by adding the averages accepted for Bengal, 1,000,000 acres, Madras, 27,000, and Ajmere, 15,000 acres. These additions would increase the figures to 18,602,000 acres for the first, 19,743,000 for the second, and 21,589,000 for the three quinquennial periods. For 1888-89 accurate figures are forthcoming to supplement those given in the above table, with the exception of those for Bengal. They are, for Madras, 20,380 acres, Upper Burma, 9,185 acres, Assam, 12 acres, Ajmere-Merwara, 9,528 acres, and Pargana Manpur, Central India, 2,831 acres;—a total of 41,936 acres. Assuming that the cultivation in Bengal remains at about 1,000,000 acres, the total during the year would thus be 20,803,013 acres. And from 1884-85 fairly reliable figures have been arrived at for Native States which formerly could not be obtained. The average of the four years, 1884-85 to 1887-88, have been accepted as follows:—

	Acres.
Rajputana	1,542,000
Central India	2,617,000
Hyderabad	1,111,000
Mysore	14,000
Kashmir	500,000
TOTAL	5,784,000

* These figures are estimates, actuals not being available.

† Excluding proportion of the area under mixed wheat, a proportion included in the figures for the quinquennial period ending 1887-88. The average area so added is 341,000 acres. The above figures for the North-West Provinces do not include the areas under mixed wheat, but these are shown in the table p. 138.

‡ Includes Sind Native States.

§ Areas in 1890-91 see pp. 168, 198.

T. 637

WHEA AREA

Increa

Total. 638

For 1888-89 the same figures are admitted, with the exception of that for Mysore, which is returned as 4,282 acres, shewing a marked falling off and reducing the total for these Native States to 5,774,282 acres. It is, of course impossible to shew to what extent the area in these States has increased, and it is therefore advisable to dismiss them from consideration in reviewing the question of expansion of area. But adding the figures to that above given for 1888-89, *viz.*, 20,803,013 acres, we get a total area under wheat, within the boundaries of the Indian Empire, of 26,577,295 acres.

From the above figures it will be seen that the area increased by 6·6 per cent. during the second, and by 10·7 per cent. during the third, quinquennial period. The returns for 1888-89 show a slight falling-off, but, as remarked elsewhere, the area under wheat, though increasing steadily and likely to continue to do so, exhibits marked fluctuations, dependent on various causes, from year to year. It will be observed that the greatest increase has been in Bombay and Berar, the two provinces closest to the chief port of shipment, and those in which a variety of wheat especially suited to the markets of Southern Europe, is grown. The forecasts for 1889-90 show a very marked falling off, especially in the Panjáb, in the Central Provinces there is a considerable increase. There is some reason to believe that in these provinces and in Berar, however, a certain proportion of the crop has been replaced by cotton. In Sind wheat has probably taken the place of other crops. On the whole, however, the poor harvests and unfavourable climatic conditions of the past three years have caused a sensible, though probably only temporary, decline in wheat area.*

It may now be considered to what extent this increase in the area under wheat has affected other crops; but it is worthy of notice in passing that, as will be shown below, the increased production of wheat, implied by the increase of area, is of itself more than sufficient to meet the demand on the outturn made by the enhanced exports of recent years, without infringing on the surplus left for local consumption. In the note on wheat above quoted, returns of all the crops cultivated during the same periods have been compiled, with the result that a steady increase in other crops and in the total cropped area, coincidently with the development of that under wheat, has been clearly demonstrated. The total cropped area increased from an average of 102 million acres for the period ending 1882-83, to 109 million acres for that ending 1887-88, that is, by seven million acres or nearly 7 per cent. And, in 1888-89, notwithstanding a slight diminution in the area under wheat, the total cropped area increased very largely on the average of the preceding five years, *viz.*, to 148,811,480 acres, of which 14,158,424 acres was cropped more than once, or an *actual* area cropped of 134,653,056 acres.

The increase during the period ending 1887-88 is analysed by Mr. Schofield as follows, the figures representing millions of acres:—

	Wheat.	Other Food Crops.	Non-food Crops.	TOTAL.
Bombay, including Sind	+ ·53	+1·19	+ ·89	+2·61
N.-W. Provinces	+ ·08	+1·00	+ ·60	+1·68
Oudh	+ ·26	+1·06	+ ·18	+1·50
Panjáb	+ ·25	+ ·15	+ ·17	+ ·57
Central Provinces	+ ·54	+ ·03	+ ·10	+ ·67
Berar	+ ·22	— ·25	— ·07	— ·10
TOTAL	+1·88	+3·18	+1·87	+6·93

* The Trade of 1891-92 necessitates a large increase in area.—*Ed., Dict. Econ. Prod.*

WHEAT AREA.

Increase.

The total increase in wheat shewn in that statement is slightly different from that recorded in the table of area under wheat, owing to the fact that in the calculation above, the areas of all crops in the permanently-settled and hill districts of the North-West Provinces, are, for the sake of greater accuracy, excluded. It will be observed that the areas under each class of crop have increased in all the provinces with the exception of Berar, in which wheat has increased 32 per cent., while the other crops have decreased by 5·7 per cent. The decrease in food crops in this province has been explained as being due to the insufficiency of grazing land, in consequence of which cultivators allow parts of their fields to remain waste to admit of a supply of grass for their cattle (*Rev. Admin. Rept., Hyderabad Assigned Districts, 1887-88*); also to the fact that *juari* has been losing favour, and is being replaced by wheat. This has come about partly because of the better price obtained for the wheat, partly because it requires considerable manuring and improves the land by enabling a longer rotation. In the case of non-food crops, the decrease is largely due to the diminution of the area under cotton and its replacement by wheat (*Conf.* Gossypium, Vol. IV., 93).

In all the other provinces an increase of other food-crops and of non-food crops has gone on coincidently with that of wheat. Thus in Bombay wheat increased by 11 and other crops by 6·6 per cent., and in only two districts, *viz.*, the Karnatak and Khándesh, is it expressly stated that the cereal has ousted another crop to any marked extent,—"There is some probability that wheat is displacing cotton in the Karnatak and Khándesh" (*Rept. Dir. Land Rec. & Agri., 1887-88, 28*). In the North-West Provinces the percentage of increase has been small, partly owing to contraction of area, consequent on unfavourable seasons during the three years 1885—1887. In Oudh, on the other hand, a considerable augmentation of cultivation of all sorts is shown, probably chiefly due to recent railway extensions in the province. In the Panjáb cultivation of wheat seems to move *pari passu* with that of other crops (*Rept. Dir. Land Rec. & Agri., 1887-88*). In the Central Provinces "the expansion in wheat cultivation has been to a very large extent counterbalanced by an increase in cultivation generally, but the area has also expanded at the expense of the areas under linseed and cotton. It should be added that neither linseed nor cotton can be grown in Jabalpur or Hoshangabad so profitably as in other parts of the provinces, and that the substitution of wheat for them was to be expected, and is certainly not to be regretted" (*Rept. Dir. Land Rec. & Agri., 1887-88*).

These facts show that while wheat has been expanding in a greater ratio than other food-crops, it can by no means be said to have done so at their expense, since the area under them has also shown a considerable, though proportionately smaller, expansion.

CULTIVATED RACES. 639

CULTIVATED RACES OF INDIAN WHEAT, AND THEIR COMMERCIAL VALUE.

As in the case of rice, very numerous races of wheat occur in India, distinguished by variation in the colour of the grains, by being "bearded" or "beardless," and by many other characters. It would be useless in such a work as the present to enumerate all the kinds distinguished by distinct names, but the more important will be noticed in the account of cultivation under each province. From 1,000 samples sent to England by Government in 1879, it would appear that the various kinds may be classified, for commercial purposes, into four distinct classes, and the following report

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RACES

Vernacular Names.
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on them, taken from Dr Forbes Watson's note, will be found to convey practically all the information available on this subject:—

CONNECTION WITH VERNACULAR NAMES.—Considerable confusion exists with regard to the Native names of the different varieties of wheat. Many samples from Bombay and the Panjáb had no names at all attached to them. Others are only distinguished as red or white wheat, or by similar generic designations in Native languages, such as *safed* (white), *lal* (red), *surkh* (brick colour), *safed gehoon* (white wheat), *lal gehoon* (red wheat). The other Hindi, Persian, or Sanskrit synonyms for wheat, *kunuk*, *gundum*, or *saman*, are also frequently employed, either alone or in connexion with the adjectives designating white or red. Whether by mistake or otherwise, the names appear sometimes to be misapplied. Thus, for instance, two samples called *lalia*, from Sitapur, consist of fine, soft, white wheat. In the same manner *lal desi*, from Muzaffarpur, *kathia lalia*, from Fyzabad, *lalia* from Lucknow, *lal pissia*, from Etawah, and some other samples similarly described, are all white, notwithstanding the use of the adjective *lal* or red. On the other hand, a "white *pissi*," from Bilaspur, is described by the valuer as a good, soft, dingy red.

"In addition to the generic designations, many specific names occur, which at first one would be inclined to consider as each applying to some well known variety of wheat with well defined characteristics. To a certain extent this seems to be the case. For instance, spread over all India from the Panjáb to Bengal, and south as far as the Deccan, appear names like the following,—*daudi*, *daudkia*, *dawoodi*, *daudkhani*, *dudhia*, which all seem to be derived from the same original name, *Daud Khani* (Prince David's wheat). Throughout the Gangetic valley the samples under these names are of a nearly uniform character, almost invariably white and soft, and frequently of a very superior quality; but occasionally, and especially in the Deccan, a very inferior hard white wheat will go under this name. Another wide-spread series of names which appear to apply to the same description of wheat are the names *mundi*, *mundia*, *mundwa*, *mandwa*, *mondha*, *mencha*, which appear to be equivalent with *muria*, *marua*, *marwa*, *maria*, *ratua*, and *raita*, *ratua*, *ratua*, as also with *ujra*. These names occur throughout the North-West Provinces and Oudh, as also in the adjoining portion of the Central Provinces, such as *pissi mundi*. They apply almost invariably to a beautiful, soft, white wheat, as a rule of a very high quality. The same holds good of *setwa*, *setua*, *setwa*, and *satwa*, as also of *saman*, *bargehuna*, *sambhari*, *sambharia*, or *samaria*, names which are frequently met with in the same districts as the above. The name *pissi* frequently used in the Central Provinces, and occasionally in the North-West Provinces, seems invariably to imply a softness of grain, whether in white or red wheat.

"But in the case of almost every other name samples of the most different character may be found. Thus, for instance, the names *gujar*, *gujra*, *gajo*, designate, as a rule, in the Agra and Rohilkhand divisions and adjoining parts of Oudh, rather an inferior sort of white wheat. Very frequently the wheat is mixed, white and red, sometimes altogether red; but occasionally samples are to be found under the same name, consisting of the finest soft white wheat, equal in value to the best specimens produced in India. The same applies to the names *kathia*, *katheh*, *kathya*, and other variations, which in most parts of India designate rather a poor sort of wheat, white or red, but mostly hard, and yet occasionally have been applied to the most beautiful samples of soft white. The term *mali* and *gargeli* [illegible] frequently [illegible] applied to wheat of the most [illegible] characteristics.

T. [illegible]

TRITICUM sativum.

Cultivated Races of Indian Wheat;

CULTIVATED RACES.

"It may, indeed, frequently happen that, even in cases in which the grain is of a different hardness or colour, the plant, known under the same name, may be distinguished by a certain similarity in outward appearance, and that only the character of the seed has become changed or degenerated. It is impossible to decide this point without possessing specimens of the whole plant. But sufficient evidence has been shown of the uncertain meaning of the Native names as applied to the grain itself to make it unsafe to adopt them as a basis of a commercial grouping of the samples sent from India. This has been, therefore, effected entirely on the basis of the appearance of the samples themselves, without regard to the names under which they were sent.

Description. 641

DESCRIPTION.—"The whole of the 827 samples submitted for valuation may be arranged in four principal groups, embracing the white soft, the white hard, the red soft, and the red hard wheat. The differences between these varieties when pure are very striking.

Soft White. 642

"The *pure soft white wheat* has a grain usually of a bright straw colour, is opaque in appearance, and the fracture is white and floury, the inner portion of the grain being friable. This is the most valuable variety for the London market, as it yields the finest flour. The Indian wheat of this description is in special request on account of its dryness, which renders it useful for admixture with home-grown wheat containing too much moisture when harvested in wet seasons. It is also liked by millers on account of the considerable increase in weight which it experiences in grinding in consequence of its power of absorbing moisture.

Hard White. 643

"The *pure hard white wheat* has a grain of a translucent, flinty, or 'ricey' appearance, varying in colour from a greyish or yellowish white to the lighter shades of brown, the fracture smooth and glass-like, and the grain hard and brittle. This kind of wheat is not much in favour in the London market, as the usual appliances of English millers do not seem to be so well adapted for dealing with it as with the soft white. It is, however, in considerable request in the Mediterranean, and especially in Italy, where it is used in the manufacture of macaroni. This is the reason why the quotation in Italy for wheat of this description is frequently as much as 5s. per quarter higher than that of the London market.

Soft Red. 644

"The *pure soft red wheat* is only distinguished from the soft white by the different colour of the skin, which varies in different varieties from an amber colour to a reddish brown. The fracture is as white and mealy as in the soft white wheat, and the grain as friable. It is eminently suitable for the English market. The Indian red varieties are, however, frequently rather smaller berried than the white varieties, and are usually much deteriorated by being mixed with barley, gram, and different oilseeds.

Hard Red. 645

"The *hard red wheat* is the darkest of any, being frequently of a dark brown colour. It is translucent in appearance, and the fracture is smooth and glass-like. It occupies the lowest position in the London market, as it is generally disliked by the millers.

"Only a certain number of the samples, however, present these characteristics with distinctness. A considerable number consist of mixtures of the primary varieties in all possible proportions, white and red, soft and hard, from which the grains of each kind may be picked out. A considerable number too, though consisting of grain of uniform quality, exhibit in the character of the individual grain a transition between some of the four varieties above mentioned. For instance, in certain samples of the Bansi wheat, from the Central Provinces, some portions of the same individual grain may be opaque and soft, others translucent and hard. In the same way, many of the samples of wheat from the Panjáb and from Bengal, although in general approaching in appearance the soft white wheat,

CULTIVA[TED] RACES

Descripti[on]

are yet considerably harder than the pure soft wheat, and yet not hard enough to be classed with the hard wheat These were usually described as semi-hard, and are in general classed with the soft white wheats The same may be remarked even more frequently of red wheat, in which, perhaps, the greater number of samples is neither completely soft nor yet decidedly hard. In colour, again, the hard white passes by imperceptible transitions into the hard red, as there are many specimens of a light brown translucent grain which might be arbitrarily classed with either the hard red or with the hard white variety.

Hard Red 646

"For the purpose of a simple classification, however, all the samples have been arranged in four groups, corresponding to the four distinctive varieties, the mixed or transitional samples being added to the group with the character of which they most nearly corresponded. Thus, all the semi-hard white wheats, or mixed wheats in which the soft white variety predominated, have been included in the same group with soft white A peculiar description of short round-berried wheat, in appearance like pearl barley, with a hardness considerably in excess of the usual soft wheat, has been likewise included with it In the same manner, most of the semi-hard red and brown wheats are included in the same group with soft red. The number of samples contained in each group appears from the following enumeration; the average price assigned to each group has been added in order to show in this way the relative estimation in which the different descriptions stand in the London market :—

Classification 647

	Number of Samples	Average price per quarter of 496lb.
		s. d
1. White, soft, and semi-hard, and pure or mixed, with a predominance of soft white	357	41 9
2. Hard white	167	39 5
3. Red, soft, and semi-hard, pure or mixed, with a predominance of soft red.	161	38 5
4. Hard red	142	36 1
TOTAL	827	39 8

"The number of samples classed with soft white and soft red amounts to 518, against 309 of hard white and hard red samples, showing a considerable predominance of soft samples, even when taking into account that among the inferior varieties of the samples grouped with the soft wheat, there are many semi-hard samples or samples of soft wheat largely mixed with hard grain. The great number of soft samples is an important fact, as it is the soft wheat which is most suitable for export to this country, as appears from the higher price realised by it.

GEOGRAPHICAL DISTRIBUTION.—"To a certain extent, the four distinctive varieties, the soft and hard white, and the soft and hard red, are cultivated side by side in the same districts, but, on the whole, a distinct geographical distribution of the several varieties may be perceived It clearly appears that, while Northern India produces mainly soft wheats, the samples produced in Southern India and part of Bengal are chiefly hard. The cultivation of the soft white wheat appears to be comprised within the basins of the three great rivers, the Ganges, the Indus, the Nerbudda, and their tributaries In fact, from the whole territory south of the Nerbudda basin only two samples of soft white wheat were sent, one from Khándesh on the Tapti, only a little south of the Nerbudda, and a sample of mixed soft red and white from the Belgaum district

Distribution. 648

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Distribution.

Whilst the North-West Provinces and Oudh sent mainly soft white samples, the majority of the samples from the Panjáb are soft red. The soft red wheat also extends farther south than the sóft white. Several fine samples were sent from Berar, from which not a single sample of soft white wheat arrived, and a sample (all but destroyed by weevil) came from as far south as Bellary. The hard white wheat occurs occasionally wherever the soft white is cultivated, but it is predominant in the Deccan, Berar, and parts of Bengal. The least valuable variety, the hard red wheat, extends the farthest to the south of all, and is, moreover, the only kind cultivated in the moist climate of the Gangetic delta, Orissa, and Burma. In the extreme south of the Madras Presidency, and in Mysore, the wheat appears to belong to a variety similar to the spelt,* in which the husk adheres so strongly to the grain that mere threshing is insufficient to separate them, so that it requires to be husked in the same way as paddy. The grain appears to be of an inferior hard red description.

Spelt Wheat 649

"In the following table, the predominant character of the wheat culture in each province is shown by the number of samples of each of the four kinds of wheat sent from them, whilst the average price for each province illustrates the influence which the cultivation of the more valuable soft and white varieties exercises on the value of the whole provincial produce:—

Name of Province.	Number of Samples of				Total number of samples.	Average price per quarter of 496lb.
	Soft White.	Soft Red.	Hard White.	Hard Red.		s. d.
Bengal	27	21	12	8	68	39 10
North-West Provinces and Oudh	251	71	37	15	374	40 9
Ajmere and Merwara	...	3	1	1	5	40 6
Panjab	17	30	3	4	54	38 5
Sind	41	2	15	...	58	39 0
Bombay	5	13	60	61	139	38 3
Central Provinces	16	13	8	12	49	40 1
Berar	...	7	31	16	54	38 10
Madras	..	..	...	18	18	36 1
Mysore	...	...	...	6	6	32 4
Burma	...	...	...	2	2	34 3
All India	357	160	167	143	827	39 8

"It appears from this table that the greatest preponderance of soft white samples occurs in the North-West Provinces and Oudh, 251 samples out of 374 belonging to this class. The average value of the samples from this province is therefore the highest of any in India, amounting to 40*s.* 9*d.* per quarter of 496lb. The two provinces in which the soft white likewise constitutes an important fraction of the samples, *viz.*, the Central Provinces and Bengal, realise also the next highest average values, *viz.*, about 40*s.* per quarter. The Panjáb would almost certainly have shown an equal, if not a higher, value, if the collection from it had been more complete, and the same would probably have applied to Sind, if the samples from there had not been weevilled throughout, in addition to being mixed frequently with barley and other grains. All the other provinces have a lower

* Compare with Dr. Watt's remarks on Spelt under "Bombay," pp. 129, 134.

average, the lowest occurring in the . . . all the samples coming from which . . .

A later valuation than that abov . . . 1880 Five . . . half by the . . . of crushing . . . bran obtain- . . . vater, and of . . . ar statement . . . qualities of . . . produced in this place.

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Synopsis and Comparison of Results obtained from Indian and other Wheats, by two Systems of Milling, by McDougall Brothers, at their Wheatsheaf Mills, London.

Figures in Roman,—System 1 Grinding and . . . System . Crushing betwe . . .

No.	Wheat.	Value in London per 496lb net weight on day of valuation s.	d.	Yield: Flour. Per cent	Middlings. Per cent	Pollard. Per cent	Bran. Per cent
1	Indian (fine soft white)	49	0	77 48	·82	8 8	13 0
	" "	49	0	74·10	11 0	8·7	4 0
2	" (superior soft red)	45	0	78 20	1 08	9·8	9 4
	" "	45	0	75 4	7·7	13 5	5 3
3	" (average hard white)	44	0	80 52	·78	10 0	8 3
	" "	44	0	73 2	10·3	14 3	3 1
4	" (average hard red)	43	0	79 88	·78	13 20	8 5
	" "	43	0	74 2	10 3	13 8	3 0
5	English	49	0	65 2	1 1	9 7	17·7
	"	49	0	70 3	7 6	7 2	9·2
6	Australian	50	6	75 8	1 1	7 4	14 4
	"	50	6	75 1	8 0	9 3	5 5
7	New Zealand	48	0	70 1	·56	6 8	11 5
	"	48 (In Liverpool)	0	76 1	7·8	6 6	5 6
8	Californian	48	0	71 1	·72	9 3	15 3
	"	48 (in London)	0	70 1	14 5	6 3	3 9
9	American (winter)	49	0	73 8	·38	7 9	16·4
	" "	49	6	71 5	10 3	11 2	3 2
10	" (spring)	48	0	71 2	·21	7 2	14 7
	" "	48	0	69 5	12 1	10 4	3·8
11	Russian (Saxonska)	52	0	71 0	1 2	11 0	12 6
	" "	52	0	71 4	12 5	11 7	3 3
12	" (hard Taganrog)	49	0	76 2	·2	11·7	8 1
	" "	49 (In Liverpool)	0	72 0	9 6	12 1	5 0
13	Egyptian (Buhi)	47	0	72 9	1 0	1·0	10 0
	" "	47	0	72 6	10 4	8 5	3·5
14	" (Saida)	41	9	66 9	·76	15 4	7 5
	" "	41	6	67 8	7 2	6 5	4 9

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Valuation.

From this table it would appear that fine soft Indian white wheat is inferior to the finest descriptions of Russian and Australian grain only, and that it possesses several properties, especially its freedom from moisture, which ought to render it of great value to millers in England for mixing. Messrs. McDougall, in their detailed statement, also comment on the exceedingly high yield of flour obtained from it, on its fine white colour, and superior bloom. From the flour obtained, bread was made, which, when compared with that from other flours, was found to be too dense and close to be likely to find favour. Messrs. McDougall sum up their report with the following interesting paragraphs:—

"In addition to the particulars contained in the foregoing returns, we have to report that to any one experienced in the requirements of the wheat and flour markets of the United Kingdom, and indeed, of most other countries, it will be evident there is no probability of these Indian wheats coming into demand for manufacture into flour *without a liberal admixture* of other wheats. They all possess in a marked degree the same characteristics of great dryness, and a distinct beany and almost aromatic flavour, inseparable from wheats grown in the climates and soils of the tropics. Also, the flours are ricey, the texture of the breads is too close, and the crust is hard and brittle. But these characteristics do not detract from their usefulness in any important degree. As is well known a miller cannot show skill in his craft to greater advantage or profit than that with which he selects his wheats, and mixes his grists, so as to produce to best advantage a flour from which bread can be made of the colour, bloom, strength, and flavour desired, and withall a good yield.

Admixture.

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"We pronounce them to be exceedingly useful wheats; in fact, hardly equalled for what is deficient and wanting in the English markets by any other wheats. Their chief characteristics are just those in which the wheats grown in our variable climate are most deficient. Their great dryness and soundness renders them invaluable for admixture with English wheats that are in any degree out of condition through moisture, and the great proportions of the wheats harvested here have been in that condition for some years past, a condition that must prevail in all other than that of wheats harvested and stored during fine and favourable weather; and this the English farmer knows, greatly to his cost, is a state of climate that is by a long way the exception rather than the rule. Added to their dryness, the thinness of the skins of these wheats and consequent greatness of the yield of flour, must always place them in the front rank as a 'miller's' wheat, whenever they are handled with reasonable intelligence and skill.

"Such unprecedented yields of flour, as shown by these wheats, ranging (by ordinary grinding) from 77·46 to 80·52 per cent., against English 65·2, and American spring 72·2, speaks volumes in their favour, and their value is still further increased by another point of merit of almost equal importance, *viz.*, a larger percentage of bread may be obtained than from any other of the flours included in this review.

"That, for the best of these Indian wheats (the fine soft white), on the day they were valued on Mark Lane market, a price was offered as high as that for American winters, New Zealand or English (see list of values in synopsis), proves that the great value of the Indian wheats is becoming recognised here, a knowledge that will ere long extend to all our markets. The other lots of Indian (Nos. 2, 3, and 4) were lower in value to the extent of 4*s*. to 5*s*. per quarter, as might almost have been expected from the difference in colour and other characteristics; still, as these latter wheats become better known here, this difference in price will be somewhat lessened. Their beany flavour is not a serious obstacle, as

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Admixture.

fair average deliveries, when well cleaned and properly dealt with, can be employed in the proportion of 25 per cent. to 50 per cent along with home-grown or other wheats, such as Americans, possessing a fine sweet, milky or nutty flavour. *Glancing at all the facts here elaborated, it is evident that these wheats afford a larger margin of profit, both to the miller and baker than any other.*

"We venture to record a conviction that we have long held, strongly emphasized by the results of these experimental workings, of the measureless importance of the great resources of the Indian Empire being developed to the utmost in producing wheat for this country. Farmers here are finding that to live they must produce beef and mutton rather than grain, hence the greater need of resources of supply under our own control.

"The character and general excellence of Indian wheats are improving with the deliveries of each successive season. The Indian wheats now specially under review were delivered to us in excellent condition, with freedom from dirt, barley, gram, and other impurities, also with a freedom from weevil rarely equalled by Indian wheats, and there is, no doubt, an outlet in this country, and the Continent for unlimited quantities."

In addition to the above it may be remarked that the hard white wheat, which in England fetches from 4s to 5s. a quarter less than soft white wheat, commands an extensive market and ready sale in Southern Europe, where it is largely employed for making maccaroni.

COMMERCIAL VALUE.

Soft White.

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Dr. Forbes Watson discusses the commercial values of the various wheats as follows:—

SOFT WHITE WHEAT.—"The quality of the samples of white wheat, forwarded to this country, is, on the whole, surprisingly high, and Mr Alexander Smith, to whom they were submitted, reports that a considerable number amongst them are far superior to any Indian wheat, ever seen in the London market. The better qualities of wheat coming from Calcutta are usually comprised under the classes No. 1 and No 2 Club, the quotations for which at the time of the last valuations, in the beginning of February of this year, were 42s. to 43s for No 1, and 40s. to 41s for No 2. By adding, the samples, which depart only a little from these values, to the numbers contained within the above classes, and by distinguishing those either above or below them in value, the samples of soft white wheat may be arranged in the following five classes:—

	Price per Quarter of 496 lb
a. Samples of superior quality	44s. to 48s.
b. " grade No 1	43s. 6d. to 41s 6d.
c. " " " 2	39s. 6d. to 41s
d. " ordinary quality	37s. to 39s
e. Inferior samples	below 37s.

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Soft White.

"The number of samples belonging to each class will appear from the following statement :—

Name of Province.	Number of Samples of Soft White Wheat (including mixed and semi-hard with predominance of soft white) of each of the Classes under-mentioned. Superior quality, 44s. to 48s. per quarter of 496lb.	No. I. Club 43s. 6d. to 41s. 6d. per quarter of 496lb.	No. II. Club 39s. 6d. to 41s. per quarter of 496lb.	Ordinary quality, 37s. to 39s per quarter of 496lb.	Inferior quality, below 37s. per quarter of 496lb.	Total.
Bengal	6	9	5	5	2	27
North-West Provinces and Oudh	81	96	44	26	4	251
Ajmere and Merwara	...	...	...	...	...	...
Panjab	7	4	4	1	1	17
Sind	...	8	14	17	2	41
Bombay	...	3	2	...	...	5
Central Provinces	7	3	4	2	...	16
Berar	...	...	...	...	...	...
Madras	...	...	...	...	...	...
Mysore	...	...	...	...	...	...
Burma	...	...	...	...	...	...
All India	101	123	73	51	9	357

"Thus, out of a total of 357 samples, more than 100 samples are better than Grade No. 1, and more than 120 samples come up to that grade. The result would have been even more favourable if a certain proportion of the samples had not been to some extent damaged by weevil.

"Four different types of grain may be distinguished among the samples of soft white wheat. These are :—

"*a*. Wheat similar to Australian or Californian, stout regular grains of a brilliant colour, mostly very soft, and usually very uniform in quality and in clean condition.

"*b*. Small berried wheat, more dull in colour than the foregoing, and less uniform in quality, hardly any sample being quite free from admixture with red or hard white wheat. Frequently the admixture of red grains is so considerable that the wheat must be called mixed rather than white, and there may be such a preponderance of hard or almost hard grains, as to give to the sample the character of a semi-hard rather than of soft wheat.

"*c*. A large berried wheat, thick in the middle, pointed at the ends, rarely uniform in colour, some grains as bright as the first variety just mentioned, others more dull and grey, occasionally passing into red, but more frequently mixed with hard grain, or passing into it by imperceptible degrees, the individual grains being often partly soft and partly hard. In fact, the greater portion of the samples of this description must be described as semi-hard.

"*d*. Wheat with a peculiar, short, roundish grain, in appearance like pearl barley. It is the wheat known under the names of *raighumbree*, *gilghit*, *giljit*, or *nikka* in the Panjab, and of *chunia*, *munia*, or *ræ muneer* in Oudh and the North-West Provinces. It occurs locally in Oudh, the

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Soft White.

North-West Provinces, the Panjáb, and Sind, but it does not possess any great importance, as it does not appear to be very prolific. Although it is mostly semi-hard or even almost hard, the samples were very favourably reported on

"The sample sent from the Delhi district under the name *Gundun safed* may be accepted as the finest type of wheat grown in India It is a soft white stout grain, remarkably uniform in quality, and in clean condition The weight is very high, amounting to 65lb per bushel It is equal to the finest wheat grown in South Australia or California, the countries from which, of all others, the finest qualities of wheat are imported It has been valued at 48*s*. per quarter of 496lb, this being the quotation for best Australian wheat at the time, and it has been declared equal in quality to the finest sample of wheat shown in the late Paris Exhibition. Nor is this an exceptional sample Wheat of equal value and of equal excellence has been sent from Gya in Behar, *Dawoodie*, from Unao in Oudh, *jamau*, from Bulandshahr and Meerut in the North-West Provinces, "*Safed*," from Dera Ismail Khan in the Panjab, as also from Hoshungabad, in the Central Provinces, white *pissi*. These places indicate the limits of the area within which the finest wheat is cultivated, and within which may be found a considerable number of samples ranging in value from 46*s* to 48*s*, which are but little inferior to the eight samples selected as types of the best wheat, and which are mostly described by the valuer as being similar to Australian or Californian wheat Not only most of the 45 samples ranging in value from 46*s* to 48*s*., but also many of the 48 samples valued from 44*s*. to 46*s*., consist substantially of wheat of the same quality; all, more or less, like Australian or Californian, and only slightly depreciated in value by weevil, by slight admixture with red or hard grains, with barley, gram, or oilseeds, or impurities of other description. The local names vary from province to province, but no corresponding difference appears in the grain. The samples belonging to this class under the various names of *Pissi* in the Central Provinces, *shori* in Sind, *Zurd kanak* in the Panjab, *Daudia, Safeda, Setwa, Mursa, Mundia*, or *Gajar* in the North-West Provinces and Oudh, *dawoodia* in Behar, are almost indistinguishable in appearance, and all of equal excellence, though under the same names many other samples may be found which are perfectly different in appearance, and often really inferior in quality.

"The varieties previously described as the small berried and the large berried respectively constitute the greater portion of the wheats of Grades Nos. 1 and 2, and of those of lower quality But in the comparatively rare instances in which they are characterised by considerable uniformity and softness of grain they range as high in value as the samples resembling the Australian wheat, whilst the value of even this latter variety may be reduced by the admixture of impurities to the lowest level observed in any of the other varieties.

"It has been already explained that both the small-berried and the large-berried variety of soft white wheat are usually of less uniform appearance than the Australian-like wheat, and that they frequently contain considerable admixture of red and of hard white wheat, so as to render it often difficult to decide whether a given sample should be classed as a red or a white, a hard or a soft wheat This seems to afford an explanation why the same name so often serves to designate varieties of wheat which appear to be very different from each other. Thus, under the name of *jamali*, a number of small-berried varieties were sent from, some of which were soft and white, others perfectly hard, white and others again, a beautiful soft red, while most were rather mixed in colour. In the same way the large-berried soft variety occurs frequent-

FORBES WATSON'S COMMERCIAL VALUATION.

Soft White.

ly under names like *burghona*, *anokha*, *kathia*, *jalalia*, and *bansi*, usually applied to hard white wheats, or even under the name of *desi* usually applied to red wheats, and, in fact, it is rarely free from a considerable admixture of hard grains, even if the individual grain does not, as is often the case with the *bansi* variety in the Central Provinces, possess a mixed character, partly soft, partly hard.

"Every defect in the way of colour, uniformity, and softness of the grain diminishes in a corresponding manner the value of the sample, but the quality is even more seriously deteriorated by the admixture of foreign substances, especially of barley, gram, linseed, and rapeseed or other grains. Other impurities, such as lumps of earth and clay, and chaff, likewise occur and often reduce the value of the wheat considerably. In many of the samples mere screening would suffice to separate the fine grain from the impurities and to improve the value by as much as 5*s*. per quarter. For instance, a sample from the Etawah district, *mundia*, has been valued at only 37*s*. on account of the considerable admixture of barley and gram, and impure condition generally, but the valuer reported that by cleaning the value could be raised to 42*s*. It may be noticed that the Sind samples especially suffer from the presence of barley, and that the wheat, which is often of the finest quality, is thereby rendered often quite unsaleable, as being in its actual condition quite unfit for milling.

"The majority of the finest specimens, ranging from 45*s*. to 48*s*. per quarter, come from the North-West Provinces and Oudh. The Central Provinces come next, and there are likewise some specimens from Behar, and from the Panjáb. No samples equal to the foregoing appear from Bengal proper, although soft white wheat, of a tolerably good quality, mostly of the small-berried kind, is grown as low down as the Hooghly district, and a sample from Beerbhoom was fully equal to Grade No. 1. As regards the Panjáb again, the best samples all come either from the Delhi and Hissar divisions immediately adjoining the North-West Provinces, or else from the Trans-Indus districts, in which the wheat resembles the fine variety cultivated in Upper Sind. But from the Panjáb proper, between the Indus and the Sutlej, no perfect samples of pure soft white were available for report, even the best being rather semi-hard than soft, and the grain less uniform than in the samples included in the fore going list. Nevertheless, it would not be fair to conclude, on this account alone, that the cultivation of wheat is conducted less carefully and skilfully in the Panjáb than in the North-West Provinces, because the fragmentary nature of the Panjáb collection already commented on, and specially the highly weevilled condition in which most of the samples arrived, make it impossible to accept the Panjáb series of valuations as a fair representation of the cultivation of wheat in that province. It must be also remarked that the softest, that is, the finest, specimens, are those most exposed to destruction by weevil, and it is likely that but for their weevilled condition some of the samples from the parts of the Panjáb referred to would have been as favourably reported on as the finest samples from the North-West Provinces. The same applies to Sind, from which a number of samples were sent equal to the finest grown in India, but their weevilled condition prevented their being valued at anything like the prices assigned to the best samples. The districts under Bombay sent no samples which could be compared with the finest wheat of the Central Provinces, but a few samples were sent from Broach and from Khándesh which come up to Grade No. 1.

"The weights per bushel given in the above list of samples are very high, notwithstanding that some of tbe samples were touched by the weevil. None weigh less than 60℔ per bushel, whilst in some cases the weight goes up to as high as from 63 to 65℔."

T. 652

FORBES WATSON'S COMMERCIAL VALUATION.

Hard White. 653

Hard white wheat.—"There is much less variety among the different samples of hard white wheat than among those of soft white wheat already noticed. A great number of samples resemble in appearance the large-berried soft or semi-hard wheat already described, only that they are completely hard and translucent. Others, with the same difference, resemble the small-berried soft or semi-hard variety. There is, in addition, a considerable number of samples with a long thin ricey grain, resembling some of the inferior varieties of hard red wheat. These latter samples, frequently known under the name of *Khattya, Kathe, Kvthya,* are really an inferior grain in
condition, most of thi
considerable quantity
many of a very high
and free from impur

Mediterranean, and especially Italy, seems to afford the best market for wheat of this description, which is in demand there for the manufacture of macaroni, and frequently fetches prices as much as 5s per quarter in excess of the quotations of the London market.

"No classification in any way resembling that of the soft white exists for the hard white wheat; but in order to obtain a view similar to that
hard white wheats have
same ranges of price as
The following table shows

Name of Province	Number of Samples of Hard White Wheat of a value per quarter equal to that of				
Bengal	3	4	5		12
N.-W. Provinces and Oudh	5	23	8	1	37
Ajmere and Merwara	..	1	...		1
Panjáb	..	2		1	3
Sind	...		8	7	15
Bombay	3	29	27	1	60
Central Provinces	...	5	3	.	8
Berar	2	19	10		31
Madras	...	.	...		
Mysore	..	..	...		.
Burma	.	.	. .	.	
Total	13	83	61	10	617

TRITICUM sativum.

Cultivated Races of Indian Wheat;

FORBES WATSON'S COMMERCIAL VALUATION.

Hard White.

sample of yellow *bakshi* sent from Nassick, had not the latter arrived very much damaged by weevil. All parts of the Bombay Presidency south of the Nerbudda supply fine samples under the names of *bakshi, bansi, bukshi, kaat, jalalia*, and others. But some of the samples from the North-West Provinces and Oudh sent under the names of *barha, tamla, mundia*, and others are equally good. One of the best samples, *ganga-jali*, valued at 42s., comes from the Maldah district in Lower Bengal, and, altogether, the cultivation of hard white wheats, if restricted to a smaller area than that of the soft varieties, results in the production of many samples equal to the finest grown in any country, which, sent to a suitable market, would be likely to realise prices almost as high as those obtainable for the best descriptions of soft white wheat. It may likewise be noted that the hard wheat appears to be on the whole less liable to suffer from weevil than the soft variety. The weights per bushel are almost as high as in the soft white; all but a few are above 60lb per bushel, some as high as 64½lb. Of the few samples below 60lb most are so much weevilled that the loss of weight is accounted for."

Soft Red. 654

SOFT RED WHEAT.—"The condition of most of the samples of soft red wheat affords evidence that its cultivation is conducted with much less care than that of the fine white varieties. They are, as a rule, much mixed with barley, gram, or oilseeds, and foreign substances of all descriptions, and the grain is rarely so uniform in its quality as in the good white samples. The striking uniformity in the Native names for the red wheat is in itself a proof of the smaller estimation in which it is held by the Native agriculturist. In the greater number of districts, in which half a dozen or more different varieties of white wheat will be cultivated under as many different names, the red wheat will be known only under the generic denomination of *lal* or *surkh*, indicating that the process of selection of seed and cultivation of special varieties has been applied to red wheat in a much smaller degree than to the white wheat. The red wheat is, however, deserving of more attention than it now receives, for the soft red varieties are exceedingly suitable for the English market, and very readily saleable. The following table shows the number of samples and their range of prices for each province in India, the classes being those adopted for the soft white wheat, as there is no corresponding classification for the red variety:—

Name of Province.	Number of Samples of Soft Red Wheat of a value per quarter equal to that of the under-mentioned Classes of Soft White Wheat.				
	Class I., 41s. 6d. to 43s. 6d. per quarter of 492lb.	Class II., 39s. 6d. to 41s.	Ordinary quality, 37s. to 39s.	Inferior quality, below 37s.	Total.
Bengal	3	11	6	1	21
N.-W. Provinces and Oudh	2	23	38	8	71
Ajmere and Merwara	2	1	..	...	3
Panjab	2	7	11	10	30
Sind	...	1	...	1	2
Bombay	..	8	5	...	13
Central Provinces	1	2	10	...	13
Berar	...	3	4	...	7
Madras	...	...	...	...	...
Mysore	...	...	...	...	...
Burma	...	..	...	...	...
Total	10	59	74	21	161

FORBES WATSON'S COMMERCIAL VALUATION.

Soft Red.

"*As may be seen from the foregoing table, the provinces in which the soft* red wheat is chiefly grown are the same as those in which the soft white is cultivated; but he limit of cultivation of the former, as previously remarked, extends rather further to the south than that of the soft white variety

"Many samples represent wheat which is very suitable for the English market. The finest sample is one from Ajmere, *Kharcha baja*; but, there are numerous samples almost equal to it from Bengal, the North-West Provinces, the Panjáb, and the Central Provinces. The samples from the provinces just named are, as a rule, comparatively light in colour, and quite as soft as the softest white wheat. But from Bombay a good many samples of a large-berried wheat were sent which deserve rather the name of brown than of red wheat, on account of the darkness of their colour.

obtained, there appears to be grown in many districts a very degenerate kind of red wheat, in which a large proportion of the grains are so thin and shrivelled that they resemble rather grass seeds than the berries of a cultivated grain.

"The prevalence of inferior varieties in the Panjáb may be gathered from the fact that out of 30 samples of soft red wheat 10 are classed as

Hard Red. 655

and their range of prices:—

Name of Province.	Number of Samples of Hard Red Wheat.		
	Ordinary quality, 37s. to 39s	Inferior quality, below 37s	Total.
Bengal	2	6	8
North-West Provinces and Oudh	4	11	15
Panjáb	.	4	4
Sind	...	..	
Bombay	31	29	60
Central Provinces	11	1	12
Berar	13	3	16
Madras	5	13	18
Mysore	1	5	6
Burma	...	2	2
Total	68	74	142

Most of these samples come from the Deccan and Southern India, and a very large proportion are inferior in quality—very thin, hard, and very dark. Wheat of this description is not in good demand in the London market."

Though the general price of wheat has altered considerably since the above report was written ten years ago, the information regarding the comparative values of the various kinds, and their geographical distribution, remains thoroughly applicable to present conditions. A selected list

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Adulteration of Indian Wheat.

of the better [illegible] will be found in the chapters on [illegible] under the [illegible] heading.

ADULTERATION. 656

Refraction. 657

ADULTERATION (Conf. with pp. [illegible], [illegible], [illegible]).

Since the commencement of the Indian export trade in wheat, it has [illegible] great [illegible] owing to the dirty condition of [illegible] the frequency of admixture with linseed, gram, barley, and other seeds. [illegible] to a large extent [illegible] Dr. Watt, [illegible] comments on this subject as follows:—

"[illegible] that the [illegible] at which the Calcutta merchants [illegible] per cent. the minimum refraction, is five per cent. [illegible] of [illegible] rather than [illegible] the truth. [illegible] large a question to deal with in this [illegible]. We were one day walking through the [illegible] on which the Mark Lane trade is transacted. One of the most influential corn-merchants in town threw [illegible] of Indian wheat and examined the dirt it contained. [illegible] the grain [illegible] sample, [illegible] up in another, he remarked, 'Could [illegible] of mud, and not adulterated with [illegible] originally? It would [illegible] market.' The reply [illegible] '[illegible] your influence to abolish [illegible] rate of refraction, and in [illegible] will [illegible] condition.'

"It is [illegible] to expect a cultivator to sell clean wheat when he would be paid [illegible] at the same rate as if it contained five per cent. of dirt. [illegible] and the Bombay Chamber of Commerce [illegible] of a desire to lower the rate of refraction [illegible] per cent. Why not abolish it entirely, and pay [illegible]? One [illegible] firm has announced that it will pay [illegible] for clean wheat than for wheat containing dirt and impurities.* "A [illegible] investigation has been instituted in every province of India into the question of this adulteration. With few exceptions, indeed, it has been found that the cultivator takes no part in the trade of adulteration. His methods of winnowing and storing are imperfect, but there is no inducement to modify these. He can clean now his grain, by the means at his disposal, considerably below the accepted rate of refraction. He makes no gain by producing clean; on the contrary, he is perfectly well aware that the middlemen employed by the exporting firms adulterate the grain before making it over to the firms that pay them at a minimum rate of five per cent. refraction. "An extensive correspondence has passed on this subject. The Indian Chambers of Commerce keep recommending to Government that the only action that can be taken is to urge upon the cultivators to grow only the better-class wheats, to avoid growing mixed crops, and to endeavour to produce as clean a grain as possible. For what purpose? That specially prepared particles of mud, to the extent of the five per cent., may be added by the middle-man at the cost of the cultivator, who is paid as if it had been there originally." There is apparently little doubt that the question does, as stated by Dr. Watt, rest almost entirely with the merchant, and that a clearly expressed demand for cleaner wheat, and a reduction or withdrawal of the present standard of refraction might be productive of much good. Since 1886 the Bombay Chamber of Commerce have agitated

* It is understood that it has withdrawn from that offer; it may be added, however, that the Bombay rate of refraction has for some time been fixed at 2 per cent., while that of Calcutta remains at 5.—*Ed., Dict. Econ. Prod.*

ADUL-
ATIO

strongly in favour of the reduction of the standard of refraction to 2 per cent, and during the past two years the question has occupied the attention both of the Government of India and home authorities. A long series of *Reports and Papers* was published in 1888-89 containing the result of much careful enquiry into the subject The following information on the forms of contract, etc., method of sales and general condition of Indian wheat in the London market, was supplied by Messrs McDougall Brothers —

"The form of contract used in the United Kingdom in the sale of Indian wheats stipulates that the quality shall be of fair average quality (f. a. q.) of that month's shipment, and does not make any mention of a 5 per cent. refraction The Corn Trade Association arranges, with dock companies and others, to draw samples from each parcel received at the different ports, and from these samples the month's average is then mixed and prepared Sales are generally made in lots of 100 tons each, and in shipping a bill of lading is made for each 100 tons, this having been found a convenient quantity A very considerable trade is now done in buying and reselling Indian wheats on the f a. q basis

F A. Q.
Contracts
658
Conf. with
pp 169-171.

"This helps to explain how it is that any parcel of special quality would receive little or no attention. Such a parcel would have to be sold by sample, and each buyer would have to inspect and pass on the sample, the first seller would have to seal it, and there would be much trouble and uncertainty if the parcel were sold several times. Thus the objection of the merchants and millers would be to selling or buying each parcel by its own special sample. If regular supplies of clean wheat could be ensured, there is not the slightest doubt but that they would much prefer, and would gladly pay for, clean wheats. We have personally inquired of many millers and dealers, and, without exception, they express a desire for clean wheat, some remarking, 'Do you not think we should give a less price for Australian wheats if they contained dirt?' Many of the largest millers have met the difficulty by erecting extensive washing and cleaning machinery, which gives them somewhat of an advantage, and so are willing that Indian wheats should continue as at present, but many millers are prevented using Indian wheats by the need of such machinery. This, we are informed, is still more the case on the Continent.

"During the last year or two special samples of 'selected Bombay' wheat have been offered upon the market, and command higher prices than No. 1, Bombay. They are guaranteed to contain—

Not more than	94 per cent. of white wheat 4 per cent. of red wheat 2 per cent. of dirt	6*d*. to 9*d*. higher price than No. 1, Bombay.
Not more than	92 per cent of white wheat 6 per cent. of red wheat 2 per cent. of dirt	4½*d*. to 6*d*. higher price than No. 1, Bombay

"It is important that different kinds of wheat should as much as possible be kept separate. The admixture of hard and soft, and white and red wheats prevents the miller using each to best advantage. Red wheat mixed with white prevents the white from being used for the finest flours. Hard wheats require damping to a much greater extent than the soft, so that if mixed together one is always either too much or the other too little damped.

"A remarkable point about the exportation of Indian wheats is that hipments of new wheat, *i.e.*, those shipped March, April, and May, are very superior to those shipped later in the season, *i.e.*, August, Sepmber, and October. These latter are often so disappointing to millers o have expected to receive bulks equal to early shipments that it has

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forced many to decline to deal in these latter shipments, for if the whole of a month's shipments were of low quality there would be no allowance on the f. a q terms. The poor quality of the late shipments may arise from the storing of wheat in pits, some part of the wheat is almost certain to be damaged, and also gets a further admixture of dirt. A remedy for this would be to store the wheat in properly constructed public granaries until required for shipment.

"Large seeds, such as gram and peas, are easily removed by sifting, and also the small seeds, such as linseed and rape, but it is almost impossible to separate such seeds as barley, &c., they being about the same size as wheat. The presence of stones is the greatest difficulty the miller has to contend with, and these are found in the red Bombay and Atbara wheats.

"The information we have gathered is unanimous on the following points:—1, clean Indian wheats are much desired; 2, extra price would be paid for clean wheats; 3, clean wheats would cause much increased use; 4, wheats carefully selected should be as near as possible of one sort, being then more valuable than when mixed together; 5, that the practice of mixing dirt and seeds is most detrimental to the practical value of Indian wheats, and urgent steps should be taken against it."

A communication from the Director of the Agricultural Department in Bengal, in 1887, shews clearly;—(1) that export houses have declined to pay any better prices for wheat with only one or two per cent. of dirt; (2) that it is, therefore, directly to the disadvantage of the Indian *rayat* or middle-man to deliver wheat with anything less than 5 per cent. of dirt; and (3) that these *rayats* and middlemen actually and systematically mix a certain proportion of dirt with their wheat before they deliver it to the export houses. In support of these facts many authentic statements might be brought forward, but the following quotation from a letter sent to **Mr. Finucane**, the Director of Agriculture, Bengal, may be accepted as forcibly representing the existing state of matters:—

"I have had a remarkable confirmation of these views from the Manager of the Dumraon Raj, the Honourable **Jai Prokash Lall**. The statements he made were so significant that I took a note of them at the time, and at the same time informed him that I should embody them in this report. The Manager said that, about two years ago, when the prospects of the wheat trade were apparently good, he seriously thought of cultivating wheat on a large scale. He estimated that on the Raja's estates there were 300,000 acres of land capable of growing wheat, and he proposed commencing operations with a capital of two lakhs. His idea was to induce the *rayats* to grow wheat alone by means of advances in coin and seed, and he intended purchasing machinery, such as he had seen at the Calcutta Exhibition, for cleaning the grain. All that he now required was a remunerative market. Last year, when in Calcutta on Council business, he called at the office of **Ralli Brothers**, and after telling them his plans asked what price they would give for clean grain. **Ralli Brothers** *informed him that, owing to the action of the merchants in England, they could not afford to pay more for a clean sample than they now did for grain with 5 per cent. refraction. Upon hearing this the Manager abandoned the idea of growing and cleaning wheat on a large scale.* It is difficult to overrate the significance of this anecdote, which appears to prove conclusively that, so long as merchants will not pay a higher price for clean grain, it is useless for Government to think of inducing cultivators to change their present practice.

No Encouragement given for Production of Clean Wheat.
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Conf. with p. 170.

Wilful.
660 "I then asked the Manager about wilful adulteration. He said that he had a *gola* at Itari, near Buxar, from which he used to sell wheat on

rather a large scale to the agent of Ralli Brothers at Buxar. The wheat, as he got it, did not contain 5 per cent. of foreign matter. Accordingly, his servants were directed to mix two maunds of earth with every 100 maunds of grain, so as to bring the adulteration up to the required standard. This earth was treated with water and specially prepared for the purposes of adulteration. The suggestion for adulterating the grain in this way came, as the Manager says, from the employés of Ralli Brothers. This fully bears out what Major Boileau says, that grain dealers in Dinapore wilfully adulterate their grain, adding about two maunds and thirty seers of dry clay, *bhusi*, and other grains to every hundred maunds of wheat. **Mr. T. Gibbon, C.I.E**, the Manager of the Bettiah Raj, told me that wilful adulteration was practised by the petty dealers in Chumparun, and **Mr. Carnduff**, writing from Hajipore, a large grain mart, says, 'In the hands of the middle-men, when the grain is lodged in their *golas*, such grains as *Akla pipra* are, I understand, intentionally added with a view to adulteration. Mr. Jenkins, from Buxar, who has clearly paid a good deal of attention to the subject, is of the same opinion

"As regards the alleged imperfection of present arrangements for winnowing, it will thus be seen that the mixture of dust from the thrashing floor forms a very small portion of the impurities found in Indian grain, and that the present arrangements for winnowing are as good as can be hoped for under present conditions. It will, of course, be desirable to effect improvements in winnowing and thrashing, should any be found possible; but the root of the evil complained of can only be reached by the abolition of the system of allowing a minimum refraction of 5 per cent, a remedy which lies in the hands of the merchants themselves. The facts mentioned by the Manager of the Dumraon Raj show conclusively that clean grain will not be forthcoming if the merchants pay for it, and that it will not be forthcoming, however perfect the winnowing and thrashing arrangements may be, so long as a minimum of 5 per cent. is allowed for impurities, be the samples ever so clean.

Winnow[ing]
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"These facts and arguments have been brought to the notice of the Calcutta Chamber of Commerce, who, while not denying their force, express regret that they are unable, in the present state of the trade, to alter the existing practice in this respect As long as that practice continues, it would appear to me to be futile for Government officers to talk to cultivators of the advantages of producing entirely clean grain. On the contrary, if Government officials interfere at all in the matter, it should be by explaining to the cultivators that it is their interest to mix at least 5 per cent. of foreign matter with clean grain before offering it for sale."

5 per cent refraction.
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It is obvious that this wilful admixture of dirt with fairly clean wheat must be a great disadvantage Not only does it decrease the value of Indian wheat and renders its extensive employment by small millers who have no cleaning apparatus, out of the question, but it involves the wasteful expenditure of the freight of some 30,000 tons of impurity annually, and a comparatively large and similarly useless expenditure in conveying the grain from European ports by rail to the localities of consumption. For many years the Bombay Chamber of Commerce have made strenuous endeavours to do away with the £ s. d. system, and to introduce sale contracts on the scale of a refraction of not over 2 per cent. In 1888 they addressed representations on the subject to the London and Liverpool Commercial Trade Associations, urging them to assist in the matter. The former Association replied by stating that they did not see their way to making any alteration, but the latter agreed to alter the standards on which wheat sales were made, and accordingly

Steps to prevent.
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ADULTERATION.

Steps to prevent.

that in future these standards should contain only 2 per cent. of dirt, seeds, and grain other than wheat.

In 1888-89 a series of questions were, at the request of the India Office, issued by Messrs. McDougall Brothers to a number of millers in the United Kingdom with the following results:—

Question 1.—Do you use Indian wheat in quantity? 249 millers state that they use Indian wheat in quantity; 259 millers only use Indian wheat in limited quantity; 2 do not reply to this question.

Question 2.—If not, are you prevented from so doing by its impurities? 348 millers state that they are partly prevented from using Indian wheats in consequence of its impurities; 41 millers having the necessary machinery to deal with the dirt, etc., are not prevented from using Indian wheat; 121 do not reply to this question.

Conf. with p. 170.

Question 3.—Would you use larger quantities if free from admixture and impurity? 461 millers state that they would use a much larger quantity of Indian wheat if they could obtain it in a clean state; 27 millers state that even if clean they could not use a larger quantity of Indian wheat; 22 do not reply to this question.

Question 4.—Is the admixture of red wheat with white wheat of serious consideration to you? 229 millers state that the admixture of red (or hard) with white (or soft) wheat is of serious importance to them, as the red hard wheat can only be reduced by 'roller mills'; 256 millers, most of whom have roller mills, are indifferent as to the admixture; 25 do not reply to this question.

Question 5.—The shipments in the later months of the year show considerable increase of impurities. Do you in preference secure the earlier shipments; and, if so, do you pay a higher price for the same? 322 millers state that they prefer the early shipments and pay higher prices for them; 16 state that they are indifferent, it being merely a question of relative values; 172 do not reply; most of these millers dealing indirect with merchants are unable to give an opinion.

Question 6.—Would you approve of a form of contract limiting the admixture of dirt, seeds, and grain other than wheat to 2 per cent. in preference to the present 'f. a. q.' form? 429 millers express their warm approval of a form of contract limiting the admixture to 2 per cent.; 4 millers are against any alteration; 77 who do not reply are mostly millers unacquainted with the form of purchase; they buy locally from merchants.

Mr. McDougall, commenting on these results in his letter to the Under Secretary of State, dated March 1889, remarks: "The replies now received conclusively prove,—1, that the impurities in Indian wheats greatly restrict their use; 2, that clean Indian wheats are much desired, and would cause a largely increased demand and a higher price; 3, that millers earnestly desire a new contract form limiting admixture to under 2 per cent.

"And I have now to suggest several means which would ensure the object aimed at:—1, by the mutual consideration of the subject by the Indian Council and by representatives from the various Corn Trade Associations; 2, by the formation of a syndicate to purchase and export clean Indian wheats; 3, by the intervention, should it be found necessary, of the Government of India, to make it fraudulent to deal in, or export grain, to be used for human food, in any way adulterated.

"I am sanguine that the first of these suggestions may of itself prove successful in bringing about the desired reform, as I cannot but think that the selfish interest of a few large firms must give way to the unanimous desire of the millers of this country, and to the great ultimate benefit of all concerned. But, if not, I do not hesitate to strongly advise that the third of these suggestions should be promptly adopted.

ADULTERATION.

Steps to preve[nt].

"In connection with this inquiry, I think the fact should not be overlooked that Italy, France, and Belgium are buyers of the better class Indian wheats, and if these wheats were clean there is no doubt this portion of the trade would receive a great impulse, as on the Continent they are less able to deal with the impurities than we are here, and consequently only the high class wheats are in demand."

"The first of these proposals was carried out by Government on the 8th May 1889, on which date a conference was held on the subject at the India Office under the presidency of Viscount Cross, G C B., Secretary of State for India. Besides members of the India Council and Departmental officials, many delegates and representatives of Chambers of Commerce, Corn Trade Associations, and large private firms were present. With the exception of the London Corn Trade Association, which maintained its former attitude of preference for the existing contract, nearly all the representatives recommended that an attempt should be made to raise the basis to 2 per cent. The general concensus of opinion, in opposition to that of the London Corn Trade Association, appears to leave little doubt that the latter body was in the wrong, a supposition confirmed by the following report of the Bombay Chamber of Commerce (1889):—"At the London Conference a statement was read on behalf of the London Corn Trade Association which, in the opinion of your Committee, contained so many mis-statements both as to fact and theory, and was so misleading in purport, that they decided to address His Excellency the Governor on the subject, with the view of recording their protest against the arguments and figures used, and, if possible, leading to further action with the view of improving the cleanliness of Indian wheat. Owing, no doubt, to the promptitude with which the matter was taken up and discussed by your Committee, and the unanswerable character of their arguments, the London Corn Trade Association have so far modified their views that in a circular, dated 14th November, they have intimated that they had taken measures to get the various qualities of Indian wheat analysed, and, as the result of that analysis, have prepared a table showing the extent of impurities in the standard samples which the Association would recognise as allowable in shipments made before and after the monsoon This table, however, so distinctly recognised a larger proportion of impurities than there was any necessity for doing, that your Committee addressed the London Corn Trade Association on the subject by the return mail, pointing out that in nearly every description of Bombay wheat, with the exception only of No. 1 Club and Red Club, the impurities allowed, even for ante-monsoon shipments, were in excess of the adulteration shown by their own analyses. This, the Committee showed, simply amounted to recognising a standard of impurity in excess of existing conditions, and so far, therefore, from assisting the movement towards greater cleanliness, would really be retrograde in effect. The Committee strongly urged the London Corn Trade Association to reconsider the subject and advocated a 2 per cent. refraction as one which would induce efforts being made to attain greater purity, and one at the same time which would be perfectly attainable without the necessity of extensive mechanical appliances for cleaning purposes. To this communication there has not as yet been time for receipt of a reply, but the Committee trust that this matter will not be allowed to rest, and that future Committees will continue to agitate for the introduction of a basis of contract which will ensure Indian wheats being exported in a cleaner, and therefore, more merchantable, condition than has hitherto been the case."

Weevils.

In addition to the accidental and introduced foreign matter in Indian wheat, a large amount of the impurity which exists is doubtless due to the action of weevils, especially in the later or post-monsoon consignments. 665

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Adulteration of Wheat.

ADULTERATION.

Romedy.

666 Many proposals have been made regarding methods of remedying this evil, and here, certainly, the remedy rests almost entirely in the hands of the agriculturists. The subject has been already discussed and need not be again gone into (see **Pests, Insects**, Vol. VI., Pt. I., 145).

Refraction.

667 It is encouraging to observe that the endeavours made to improve the standard have met with a certain, though as yet very insufficient, amount of success. Thus the Hon'ble Mr. Benett, in the final crop report for the year 1889-90, writes:—"The Liverpool and London Corn Trade Associations have now reduced the refraction for Calcutta and Bombay shipments from a uniform amount of 5 per cent. to quantities varying for ante-monsoon shipments between 3 per cent. and 4 per cent., of which 1½ per cent. may be dirt, and for post-monsoon shipments between 3½ and 5 per cent., of which 2 per cent. may be dirt. In the case of Karachi, however, it has been considered necessary to fix the high rate of 5 per cent. for ante-monsoon and 7 per cent. for post-monsoon shipments. The Bombay Chamber of Commerce has pointed out that there is really no difficulty in buying wheat with impurities not exceeding 2 per cent., and confirms the conclusion that the mixture with dirt is made between threshing and shipment. The concession of the Association therefore, it is to be feared, will but little affect the trade. But though slight, it is perhaps an indication of a tendency to give way under the pressure which has been brought to bear on the London Association by several of the other commercial bodies, and in particular by the valuable evidence brought to light at the conference held at the India Office. On that occasion it was clearly shown that although speculative buyers might all prefer the higher refraction, the millers of the United Kingdom were exceedingly anxious to obtain the cleaner article, and were largely prevented from using Indian wheat by its high percentage of impurities, due solely to the high refraction with which it is bought.*

Conf. with pp. 110, 169.

"The Government of India, at the instance of the Secretary of State, is in correspondence with Local Governments and Administrations regarding the expediency or otherwise of introducing grain-elevators into India with the view of cleaning, grading, and handling wheat. The introduction of these methods, it is to be feared, however, will be useless until the trade shows itself ready to buy clean, and nothing but clean, wheat The elevator system, however, has the merit of doing away with the necessity for arbitration and analysis of samples. It is being introduced by Russia and may serve to increase the advantages which that country already possesses over India in its competition for the wheat trade of Europe."

PRICES.

PRICES.

668 The local prices of wheat and other food-stuffs have been recorded fortnightly in every district, and even in every large town in each district during the past thirty years. An examination of these elaborate returns reveals the fact that the price paid by the consumer to the local grain merchant has varied excessively from month to month and from year to year; indeed to such an extent has this been the case that it would be quite unsafe to attempt to express average prices for large areas. India, unlike England, is entirely dependent on her own produce for her food-supply, hence scarcity or superabundance brings about an instantaneous change in local

* It is understood that an advantage of much moment to those who have desired to uphold the refraction standard exists in the fact that wheat, when purchased by measure and sold by weight, leaves a large margin of profit owing to the greater weight of the adulterants. If this be so in India, it seems desirable that this feature of the controversy should be more clearly brought out than has been done hitherto.—*Ed., Dict. Econ. Prod.*

Purchased by measure sold by weight.

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PRICES.

prices. Both these conditions may prevail during the same season in two neighbouring provinces, or even in districts of one province, since intercommunication has as yet by no means reached a degree of perfection. But a tabular statement of the average annual prices at certain selected stations as published by Mr. O'Conor may afford a fair indication of the fluctuations and gradual tendency towards rise or fall of the prices:—

Prices of Wheat in certain selected stations, from 1861 to 1889, in seers to the rupee

	Calcutta.	Patna.	Cawnpore	Fyzabad.	Meerut.	Delhi	Rawálpindi.	Karáchi	Ahmednagar.	Bombay	Jubbulpore	Raipore.
	Seers.	Seers.	Seers	Seers.	Seers.	Seers	Seers.	Seers	Seers.	Seers	Seers.	Seers.
1861	16.76	23.24	17.25	25	16	14.7	29.04	19.68	18.5	12.6	25	48
1862	18.62	16.21	27.5	28.5	33.5	26.34	26.59	15.24	15.5	11.95	29	83
1863	20.48	32.17	28.5	27	33	25.32	29.74	15	13	9.65	23	61
1864	14.89	16.21	19.75	22	23.75	21.34	25.42	10.25	10	7.9	31	32
Average of 4 years	17.69	21.95	23.25	25.62	26.56	21.92	27.7	15.04	14.25	10.52	27	55
1865	14.89	16.89	16.75	16.5	20.75	14.77	27.12	11.56	10.5	8.47	20	22
1866	11.66	10.54	14	13.75	23.5	19.47	27.6	11.75	10.5	6.5	13	20
1867	21.42	15.19	16.75	23.5	21.5	21.08	24.37	13.33	11.75	8.95	21	36
1868	16.76	30.61	20	17.5	25.75	20.9	12.65	13.87	14.5	10.19	15	36
Average of 4 years	16.18	18.31	16.87	17.81	22.87	20.3	22.93	12.63	11.81	8.53	17.25	28.5
1869	14.43	13.04	11.5	13.75	13.25	11.66	13.29	13.62	10	8.47	11	15
1870	14.43	12.02	15.5	19	15.75	12.91	15.09	10.28	8.75	8.95	15	23
1871	15.91	23.94	24.11	24.65	24.35	21.87	17.92	11.67	14.3	10.21	21.87	48.15
1872	14.14	19.9	19.29	16.39	24.43	20.89	18.8	14.22	13.25	10.94	21.65	41.83
Average of 4 years	14.73	17.22	17.6	18.42	19.44	16.83	16.27	12.45	11.75	9.64	17.63	31.99
1873	11.53	15.95	10.58	15.25	20.24	19	18.47	15.41	17.99	11.64	19.75	42.27
1874	12.45	16.88	17.35	16.13	20.75	19.27	23.56	14.35	23.26	12.38	20.59	41.6
1875	16	23.41	23.28	24.43	22.32	22.41	28.91	12.8	17.46	11.88	26.83	46.54
1876	17.1	25.39	25.1	25.95	25.83	24.75	32.48	12.81	16.95	11.64	26.53	53.74
Average of 4 years	14.27	20.41	20.58	20.44	22.28	21.11	25.85	13.84	18.91	11.88	23.42	46.04
1877	13.06	19.11	16.08	10.37	19.83	18.47	28.51	11.81	9.46	8.21	20.38	42.59
1878	11.19	14.56	13.8	12.74	14.99	14.1	18	9.37	7.42	6.58	11.34	19.48
1879	12.3	14.12	14.17	14.16	14.94	14.1	9.23	7.29	7.63	6.93	11.33	19.68
1880	13.06	19.94	18.24	18.08	18.53	17.48	10.9	10.31	11.69	8.93	16.8	25.54
Average of 4 years	12.58	16.93	15.6	15.39	17.07	16.04	16.66	9.84	9.05	7.66	15.01	26.87
1881	15.4	22.65	20.47	18.9	20.45	19.37	13.13	13.08	16.2	10.99	21	39.08
1882	13.2	19.44	18.68	17.18	18.55	18.59	20.27	13.20	14.01	10.37	18.52	31.53
1883	13.1	19.17	18.73	17.71	18.02	18.97	24.89	13.32	14.02	10.29	19.99	23.46
1884	16.02	20.9	22.02	19.76	20.42	20.02	30.8	14.01	13.89	11.22	23.59	29.25
Average of 4 years	14.43	20.54	19.97	18.30	19.30	19.24	22.27	13.4	15	10.72	20.77	30.83
1885	15.45	21.26	22.49	21.14	22.25	22.5	28.21	14.27	15.91	11.39	21.21	34.32
1886	15.14	20.95	19.65	18.9	18.36	19.08	21	11.85	14.19	10.38	16.44	26.58
1887	14.17	18.79	16.42	15.11	15.09	14.71	13.87	11.19	12.34	9.93	15.8	21.77
1888	12.98	17.72	16.19	14.83	15	14.75	14.58	11.61	12.83	9.6	14.83	21.53
Average of 4 years	14.43	19.68	18.69	17.49	17.67	17.76	19.41	12.23	13.82	10.32	17.07	26.05
1889	12.92	16.64	16.63	4.62	16.96	17.29	19.08	11.79	13.09	9.91	15.29	20.31

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Production of Wheat in India.

PRICES.

It is evident from these figures, that the price of wheat in India depends almost entirely on local conditions, and is practically quite unconnected with the question of foreign demand.

In Europe the prices of wheat from every source have undergone an almost continuous fall for many years. It is worthy of note that Indian wheat has relatively maintained a somewhat higher value than others. Thus, Mr. McDougall publishes the following comparative list of prices for No. 2 Club, Calcutta, and English wheat, from 1877 onwards:—

	No. 2 Club, Calcutta.	English.
	Per 492lb	Per 480lb
1877	50·6s.	56·9s.
1878	46·3	46·5
1879	50·0	43·10
1880	45·3	41·5
1881	45·0	45·4
1882	43·4	45·1
1883	39·1	41·7
1884	32·10	35·8
1885	33·2	32·10
1886	31·10	31·0
1887	31·1	32·6

In June 1888, the Mark Lane price was 32*s.*, and, at the same date in 1889, it had fallen to 29*s.* per quarter.

In 1890 the prices ruled very closely with those of 1888, *viz.*, 29*s.* 10*d.* per quarter until the first half of May, when there was an upward tendency, the latest quotation up to June 12th being 31*s.* 7*d.* per quarter.

PRODUCTION 670

PRODUCTION.

The question of the total wheat production in India is one which there is some difficulty in estimating, but is of much interest as bearing on a possibly increased demand for the Indian cereal. Dr. Forbes Watson, in his paper on Indian Wheat in 1879, made the following estimate of the wheat outturn of various countries:—

"All available facts point to the conclusion that, as regards wheat, India may shortly become one of the chief sources of supply for the United Kingdom. It must be borne in mind that India is one of the largest wheat-producing countries in the world. The production of the United Kingdom amounts to only about 10,000,000 to 13,000,000 quarters per annum. Austro-Hungary, Italy, and Spain each produce about the same quantity. Germany produces from 15,000,000 to 18,000,000 quarters, and the two countries which produce the largest amounts are France and Russia, each producing from 30,000,000 to 35,000,000 quarters per annum. Both are surpassed by the United States, which produced during each of the past two years upwards of 45,000,000 quarters. No complete stadtistics exist for India, but we know that the Panjáb alone produces about as much as the United Kingdom, Oudh about 3,500,000 quarters, the Central Provinces about 3,000,000, and Bombay not much less. The production in the North-West Provinces proper has never been estimated, but must be fully equal to that of the Panjáb, and that of Behar is also known to be considerable. Thus the yearly production of the provinces under direct British rule will amount to from 30,000,000 to 35,000,000 quarters, or to the same quantity as that produced by Russia

PRODUCTION

or France. But if the Native States in the Panjáb, Rajpútána, Málwa, Bundelkhand, and Guzerat be added, in all of which wheat is largely cultivated, it will be found that India must be considered as being, next to the United States, the largest wheat-producing country in the world."

The statistics from which the above estimate was founded were avowedly deficient, and more recently acquired data indicate that the 35 million quarters assumed by **Dr. Watson** are in excess of the actual. The Government of India, in its first large publication on wheat production, after the issue of **Dr. Watson's** report, calculated the outturn on a total area of 19,329,200 acres to be 26,548,000 quarters of 480lb or 6 maunds, which, adopting the figures above given for other countries, would make India stand fourth in point of production, following the United States, France, and Russia. In the Central Provinces, the North-Western Provinces and Oudh, and the Panjáb the accepted average yields per acre were, in the same publication, stated to be 8 bushels, $11\frac{3}{8}$ bushels, and $13\frac{1}{3}$ bushels, or 6 maunds, $8\frac{3}{4}$ maunds, and 10 maunds, respectively. These figures must, however, be more or less approximate only, since the rates of yield necessarily vary greatly with the variety of seed cultivated, with the greater or less care bestowed on it, and with the degree of irrigation. These questions will be separately discussed in the account of each province.

The average outturn of the four years from 1884-85 to 1887-88, on an average total area of 26,508,000 acres, is estimated to have been 7,205,500 tons, or a little over 31 million quarters of 480lb or 6 maunds. In 1888-89 an outturn of 6,510,979 tons was estimated on the area shown by the crop forecasts for the year, *viz.*, 26,381,765 acres, an estimate a little more than 200,000 acres under the actual. The former of these, which give an average acre-yield for all India of a little over 7 maunds, may perhaps be accepted as a fair average. The latter represents a crop which was on the whole under average, owing to an untimely and unevenly distributed rainfall, and the acreage yield is consequently less, a little under 7 maunds.

Average outturn. 671 *Conf. with p. 198*

In addition to the 31 million quarters returned as the outturn for four average years, it must be remembered that a large quantity of wheat is grown as a mixed crop and, in agricultural statistics, comes under returns of unspecified food-grains. If the area and outturn for these crops be included, a due deduction being made for the proportion of the yield from barley, grain or other plants with which the wheat is mixed, it is not improbable that the total outturn of the grain in India might approximate very closely to, if it did not actually attain, **Dr. Forbes Watson's** estimate of 35,000 quarters.

WHEAT CULTIVATION.

CULTIVATION. 672

In the foregoing chapters on area and production, the more important features connected with the development of Indian wheat cultivation have been dealt with, chiefly with the object of demonstrating the fact that the wheat trade up to its present stage, is a perfectly natural one. All the facts go to prove that this is so, and that the agricultural population are exporting only what they specially cultivate for that purpose. And there appears to be little doubt that so long as wheat proves a remunerative crop, its area will continue to increase, but that as soon as better profits can be realised on another crop, the *rayat* will turn from wheat and readily assume the cultivation of the more profitable crop with little or no inconvenience or pecuniary loss to himself. Wheat, however, is also grown, as already shewn, to a certain extent as a staple food-crop for home consumption, and will probably always continue to be so.

Some of the more important features having been thus dealt with as

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Cultivation of Wheat

CULTIVATION in the Panjab.

a whole, we may now proceed to consider in detail the wheat cultivation of the several provinces. This has already formed the subject of many exhaustive and valuable official reports. After the issue of Dr. Forbes Watson's report, frequently alluded to above, Her Majesty's Secretary of State called for information to be furnished from all India, as to the nature of the soils on which the better wheats are cultivated, as well as details of the methods of cultivation. This stimulated detailed investigation, with the result that first one, and then another, volume on "*The Wheat Production and Trade in India*" was produced in 1879 and 1883. Since the appearance of the last of these, separate publications have been issued by several provinces on the subject. From these works and from the settlement, administration, and agricultural reports, the information obtained in the succeeding chapters has been mainly derived. The writer has also to acknowledge liberal quotation of many passages from a pamphlet published in London in 1888, by the editor, Dr. G. Watt, on "*The Conditions of Wheat-growing in India*," a paper which contains, in condensed form, a *résumé* of all available information up to the date at which it was written.

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References.—*Gazetteers:—Ambala, 48, 49; Amritsar, 35-37, 47; Bannu, 132, 133, 135, 137-141, 144, 149-152; Delhi, 98, 100-103, 111, 113, 121, 139, 140; Dera Ghazi Khan, 31, 80, 81, 83, 84, 91, 92; Dera Ismail Khan, 122-125; Ferozepore, 65, 68-70, 74-77; Gujranwala, 53; Gujrat, 77-80; Gurdaspur, 51, Gurgaon, 81, 82, 90, 91; Hazara, 124, 125, 130, 131, 134, 135, 137, 143, 146-148, 150, 151; Hissar, 46, 48; Hoshiarpur, 86-89, 117; Jalandhar, 44; Jhang, 106-109; Jhelam, 98, 99, 104, 106; 108, 109; Kangra, I., 148, 149, 152, 154-156, 161; II., 57, 58, 64; Karnal, 157, 172, 180, 183-185, 196-200; Kulu, 57, 64, 96; Lahore, 85, 88, 102; Ludhiana, 138; Montgomery, 116, 117; Mooltan, 93; Muzaffargarh, 93, 94; Peshawar, 144,-146; Rawálpindi, 78, 80, 81; Rohtak, 90, 92-95; Shahpur, 64, 65; Sialkote, 63, 68, 69; Agri.-Horti. Soc. Panjáb (1853), 111; Indian Agriculturist, Jan. 25, 1890; Ind; Forester, X., 369; Settlement Reports:—Bannu, 40, 53, 76, 81-83, 85, 86; Delhi, 30-32, 38, 40, 43, 106, 107, 222, 224, App. xxxiv.; Dera Ghazi Khan, 8, 9, 12, 44, 45, 63, 72; Dera Ismail Khan, 7-16, 24, 28, 342, 350, 351; App. xxiii; Ferozepore (1855), 3, 7, 31-33, 83; (1875), 6, 8, 9, 12, 15, 22, 24, 25, 27; Gujarat (1860), 132, 136; Gujrat, 34, 77, 79, 84, 92, 96, 98; Gurdaspur, 13; Gujranwala, 11-13, 28, 32, 33, 37, 41, 44; Hazara, 82, 88-90, 102, 105, 171-174, 177; Hoshiarpur, 11, 22, 30, 31; Jhang, 57, 80-87; Jhelam, 37; Kangra, 24, 26, 76, 78; Kohat, 2, 3, 12, 120-122, 155, 160-165, App. xli; Lahore (1858), 11, (1865-69), 7, 9, 32-37; Montgomery, 102-112, 127; Peshawar, 19, 135, 184, 188, 213, 215, 219, 225, 228, App. xxxiv., xlii., lii., liv., lxvi., lxxiv., lxxxiv., ciii.-cvii.; Rawálpindi, 19, 20, 26, 59; Rohtak, 62, 86-93; Sialkote, 19, 31-33, 37, 54; Shahpur, 18, 19, 28, 89, 94; Simla, 13, 15, 31, 34, 42, 44, App. xi.-xv., xxiv., xxxv.-xxxix.; Sirsa 57, 64; Forbes Watson, Rept. on Indian Wheats, 1879; Repts. on Wheat Production and Trades, Govt. of India, 1878, 1883, 1886; Wace, Panjáb wheat; Crop Repts. and Forecasts.*

The cultivation of wheat in the Panjáb will be considered in some detail, for so much exists, common to all the wheat-producing areas of India, that the more characteristic features may be disposed of in one place, leaving only special modifications to be commented on afterwards. It may, perhaps, be advisable to commence with the consideration of the soils, which has been discussed by Dr. Watt as follows:—

Soils.
674 SOILS.—"In the Panjáb, soils may be classified, first, according to the mode in which they are irrigated; secondly, according to their composition. With slight local modifications the remarks which we here offer are applicable to the whole of the alluvial parts of India. One of these tracts of country or regions with a peculiar soil may pre-

CULTIVATION in the Panjab.

Soils.

dominate more in one province than in another; and in some instances the specific character of the soil may be modified or intensified. The main features are, on the whole, preserved We shall establish, therefore, in this place, a standard from which, in our subsequent remarks under other provinces, we shall record departures and modifications.

"From the numerous mouths of the Ganges, and sweeping round the whole length of the Himálaya, at the same time isolating the great southern tableland, there extends a vast alluvial plain, which is only lost in the North-West Provinces and the Panjáb by blending into the drainage area of the Indus. From this point a similar alluvial region is continued to the mouths of the Indus, and may be said to widen until it embraces the northern division of Bombay. In the Bengal section of this vast expanse, the clay soil of the rice swamps can only be viewed as land, figuratively speaking, recently recovered from the sea; and immense portions of it are even now within tidal influence

"The bulk of Bengal is rain-inundated Passing higher up the alluvial basin, evidences of a more ancient soil, indeed, of a more ancient agriculture, are to be seen in the rich loam of Behar This soil continues with varying degrees of fertility through the North West Provinces to the Panjáb, and down the tributaries of the Indus to the basin of the combined stream, until it reaches the swamps of the western coast. Throughout this loam expanse there are two modifications. First, on the inundated tracts of the rivers and on depressed portions of the country (in most cases these are but the old beds of former streams, or the silted-up lakes which were thrown off as contortions of the river, isolated by the main stream taking the more direct course through a narrow isthmus), rich clayey loam occurs which merges in its character into the heavy mud soil of Bengal. Secondly, within the regions of climatic extremes, natural growth and cultivation alike have been checked, and loam is there found to be more and more intermixed with sand, until absolute sandy deserts are attained.

"Thus there exist four types of soil in the alluvial plains of India: a heavy loam, in which clay predominates (the muddy swamps of Bengal), a heavy loam, with a certain amount of sand, in which the clods remain firm (the lowlying and inundated tracts of Upper India); a light loam, in which the clods are pulverised on being let fall from the hand (the principal soil of Behar, the North-West Provinces, the Panjáb, and a certain portion of Bombay and Sind); and lastly, a poor loam with a large admixture of sand, passing into pure sand in which clods do not form at all (the soil of some parts of the North-West Provinces, of a large proportion of Central India and of Sind, with also certain parts of the Panjáb) The intimate relation of the two features of soil alluded to in the opening sentence of this paragraph has been thus exemplified. The absence of water, together with the extremes of heat and cold, have had much to say on the production of desert tracts, and annual inundations have greatly tended to preserve the heavy loams

"There are certain agricultural terms used in the Panjáb, but fairly well understood throughout India.

"Land that is dependent on rain is known as *baráni*; if watered by canals it is *nahri*; *chahi* is watered by wells, and *abi* from tanks. The word *doáb* signifies a region between two rivers. The five great streams of the Indus break the Panjáb into vast interfluvial expanses or *doábs*, so that, to understand Panjáb agriculture, this feature must be fully appreciated. The tracts annually inundated by the rise of the rivers, or kept moist from being adjacent to flooded land, are known in the Panjáb as *bhet*, *banjar*, or *sailába*, and in other parts of India as *khadar*, but by the Hindustani-speaking population this name is even used in the Panjáb.

CULTIVATION in the Panjab.

Soils.

The chief danger such regions are subjected to is the growth of the saline efflorescence known as *reh* (a crude sulphate or carbonate of soda).

"Land beyond the *bhet* influence is generally known as *desya* in the Panjáb, and to Hindustani-speaking people as *bángar*. This may be *chahi*, *abi*, *nahri*, or *baráni*, according to the source from which it derives its water. The interior or higher portions of the *doáb* are often spoken of as *des-utar*, (in contradistinction to *hetár*) or *máhjah*.

"The names given to denominate the physical character of the soil are:—1. *Nyái*, rich land around the homestead, on which vegetables, tobacco, poppies, etc., are grown.

2. *Dákar* or *chamb*, heavy clayey loam, too low for being drained. This is good for rice and grain. The term *rákar* in the Panjáb denominates bad *dákar*, on which rice only can be grown.

3. *Rausli* or *dosahi* (*dusháhi*) is the light, easily pulverised loam which we have spoken of as the most prevalent in Upper India. This yields all crops except rice. It is soft and easily worked, mixes readily with manure, and consists of clay and sand. It is probable that the term *dosahi* denotes a slightly inferior quality of *rausli* with more sand; just as *rohi* would appear to be a rich soil approaching to *dákar*, only well drained. *Rohi* is admittedly the finest form of soil in the Panjáb.

4. *Bhúr* or *maira* is light sandy loam, suitable for the cultivation of millets. In this soil the sand predominates over the clay. *Tiba* is almost pure sand, *reti* being a soil with wind-blown hillocks of sand.

"Other terms are used in the hill tracts of the Panjáb, and nearly every province has special terms for local modifications of the soils we have indicated. As such names can be of little interest to persons not residing in India, we shall accept the above as conveying a general description of the characteristic soils of the alluvial basin of India. A separate account will be found under the Central Provinces of the soil, terrestrial character, and peculiarities of the southern tableland. From what has been said, a general idea, it is hoped, has been conveyed of the character and fruitfulness of the soils of the plains of India. The absence of a water-supply will, of course, make the best *rausli* land entirely dependent on the rains, and the inequality and insufficiency of the rains of the Panjáb leave neighbouring tracts either uncultivated or at most only occasionally thrown under crops. This is the field for the future operations of the canal engineer. A judicious control over the supply of canal water has made these arteries carry life and fertility where formerly rich undulations of fertile soil bore only a scanty herbage. Where artificial aid, in the form of canals, is not brought to the cultivator, it will be seen, from the account of soils, that there are narrow limits within which displacement of crops can be practised.

"The climate prescribes a limit to the *rabi* as to the *kharif* crop. The varied nature of the soils is such that a second check is given to the dangerous disturbance of established and natural conditions of agriculture through any greed the cultivator might manifest in desiring to reach a hand forward to the hard cash offered by an export trade like that of wheat. The extent to which the owner of a *desya* or *bángar* farm can supplant millets with wheat must depend on a chapter of accidents: the abundance of water in his wells (even should he possess such), the rainfall, the proximity of his fields to the irrigation canals, the character of the soil on which his labours from year to year have been expended. Should his fields fall under the class we have defined as *bhúr*, then, without manuring to an extent which would never pay, he must rest content with his millet and pulse crops, for in such soils, in the majority of cases, wheat-cultivation is a physical impossibility.

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CULTIVATION in the Panjab.

"While wheat-cultivation cannot, therefore, expand into the *bángar-bhúr* lands, there are immense tracts of *rausli* which wait only for means of export, or for a supply of water, to be at once thrown under the finest varieties of wheat."

Irrigation. 675

AREA AND IRRIGATION.—The areas in each district of the Province during the year 1888-89 under pure wheat were as follows:—

Area. 676

Conf. with p. 94.

District Cultivation. 677

District.	Irrigated.	Unirrigated.	Total.
Hissar	27,236	52,048	79,284
Rohtak	26,259	42,765	69,024
Gurgaon	22,968	39,587	62,555
Delhi	33,001	92,478	125,479
Karnál	59,890	93,436	153,326
Ambála	11,266	257,860	269,126
Simla	433	4,416	4,849
Kangra	44,725	149,167	193,892
Hoshiarpur	7,692	310,594	318,286
Jullundur	114,488	157,415	271,903
Ludhiana	73,141	159,065	232,206
Ferozepur	222,380	245,882	468,262
Multan	242,714	34,963	277,677
Jhang	135,674	39,978	175,652
Montgomery	146,658	36,921	183,652
Lahore	332,589	65,507	398,096
Amritsar	217,556	107,978	325,534
Gurdaspur	70,585	237,971	308,556
Sealkot	209,374	159,408	368,782
Gujrat	136,170	169,345	305,515
Gujranwála	213,318	39,003	252,321
Shahpur	121,828	101,584	223,412
Jhelum	17,220	412,711	429,931
Rawálpindi	9,081	467,683	476,764
Hazára	11,330	112,532	128,862
Peshάwar	94,312	175,146	269,458
Kohát	15,680	78,293	93,973
Bannu	83,326	221,599	304,925
Dera Ismail Khan	96,749	156,014	252,763
Dera Ghazi Khan	86,444	54,084	140,528
Muzaffargarh	164,810	47,574	212,384
GRAND TOTAL	3,048,897	4,323,080	7,371,977

The expansion of this area has already been noticed in the chapter on AREA. Taking an average of all years the increase has been somewhat smaller than might at first sight have been expected in a province of which the staple has always been wheat, and which has still an immense area of cultivable land unoccupied. But this, owing to the extensive arid tracts, must necessarily depend entirely on the development of irrigation, therefore no rapid expansion can be looked for. Great efforts are, however, at present being made to extend the canal system through these tracts, and a slow but sure expansion may, therefore, be looked for. The Director of Land Records and Agriculture for the province states (*Report, 1887-88*) that the area under wheat of a given year depends largely on the rainfall, a bad *kharif* with a good rainfall in September resulting in extended wheat sowing and *vice versâ*. The possible maximum variation must be very great, seeing that during the period from 1880 to 1886-87 the difference between the maximum and minimum annual area is as much

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in the Panjab. Qualities. 678

as 27 per cent. This fact probably explains, at least to some extent, the large expansion during the past year.

RACES AND QUALITIES.—The late Colonel Wace, in his elaborate report on Panjáb wheats, states that the "soft red" is grown on 5 million out of the total of 7 million acres under wheat cultivation. Notwithstanding the fact that this race is less suitable for export than the soft white, Colonel Wace deprecates the charge brought against the cultivators that they are careless as to the selection of seed, and states that they are by no means indifferent to securing seed of a good quality. It is, therefore, probable that if the advantages of growing the soft white form were pointed out to the agriculturalist and the small Native merchant, its cultivation might be taken up to a greater extent, and thus bring a larger quantity of more valuable wheat into the market.

Dr. Forbes Watson selects the following as among the best samples submitted to him:—

Commercial Class.	District.	Name.	Weight per bushel.	Price.	REMARKS.
				R a.	
SOFT WHITE .	Delhi . .	Gundun-safed	65	48 0	Like Australian.
	Sarsa . .	. .	61	45 0	
	Dera Ismail Khan .	. .	63	48 0	Like best Californian.
HARD WHITE.	Sarsa . .	Brown wheat	60½	41 0	Small berried.
SOFT RED .	Gurgaon .	. .	64	41 6	
	Rohtak. .	Red wheat .	62	41 0	
	Jhelum. .	Lal . .	61½	41 0	
	Shahpur .	Rati . .	61	41 0	Large berried, mixed with barley.
	Dera Ismail Khan .	Rutti kanak .	60½	41 6	Long berried.

In the report from which the above is extracted, Dr. Forbes Watson made definite allusion to the "weevilled" condition of the samples received from the Panjáb and Sind. In consequence of this a second series was forwarded from the Panjáb during 1880 for supplementary valuation and report. Of 192 samples, 31 were soft white, 67 hard white, 31 soft red, 59 hard red, and 4 mixed. The average value of all was 46*s.* 10½*d.* per quarter, the prices ruling for all wheats at the time being about 4*s.* 6*d.* per quarter higher than at the period when the first report was written. The general quality of the samples was, however, very much superior, the hard reds especially having risen greatly in value.

The Gazetteers contain long lists of vernacular names of different forms of wheat, which it would probably serve no very useful purpose to reproduce. It may, however, be noticed that the red wheats are spoken of as being preferred, partly because its outturn is greater, partly because it can be grown in inferior soils and unirrigated tracts, since it requires less moisture. With the extension of the canal system, therefore, an increased proportion of the more valuable soft white wheats may be expected. Bearded, *kinjharí*, and beardless, *rodí*, wheats are also distinguished. A form known as *pamman* in the Muzaffargarh district is highly valued and cultivated as a luxury for the richer classes.

Methods. 679

METHOD OF CULTIVATION.—Dr. Watt continues:—"The wheat crop of the Panjáb is sown on *rausli* and *rohi* lands, and sometimes also on

CULTIVATION in the Panjab.

Methods.

... soil and source of water-supply.
... on the systems adopted in Delhi,
... ntgomery, Dera Ismail Khan, and

... y for well-irrigated lands has been
... During the rains in June or July the land is ploughed two or three times and smoothed. If rain has been plentiful and the ground remains moist, seed is sown broadcast in October, November, and December. The ground is then again ploughed and smoothed, and the beds formed. If there is subsequent ra... fields are irrigated from wells or
... rain, nine or ten times. If there
... , or if the land does not remain
... e the seed is sown. If the seed
... result: if in November, about
... October; and if sown in Decem-

... last inundation during ...

... hree or four

... , but chiefly

... and perhaps the second year, but afterwards deteriorates

... There is no reason to suppose that the land has deteriorated from

CULTIVATION in the Panjab.

Methods.

over-cropping. Except in highly-manured lands, wheat is grown year after year."

The opinions recorded are decidedly opposed to the view that the soil deteriorates under wheat. But one officer writes, " it is unquestionable that the finest crops are raised on lands newly brought under canal irrigation".

"About one-third of the whole cultivated area of the Panjáb is cropped with wheat. The acreage represented by this fraction is liable to considerable variation, due mainly to the character of the seasons, and the gradual increase of cultivation in general." Two-thirds of the annual cultivation consists of other than wheat crops, manuring is regularly resorted to when found necessary, and at least a seasonal if not an annual rotation is regularly observed, so that there is little reason to fear that the expansion of wheat cultivation in the province is in any way endangering the fruitfulness of the soil. A large proportion of the canal-irrigated area, and from ⅓ to ¼ of the area irrigated by wells, were officially stated in 1883 to be double-cropped, giving a wheat, *rabi*, and some other *kharif* crop every year. Other wheat lands are said to be generally cultivated on one or other of two plans. The first, which is generally followed by the best cultivators, is a two-year course, in which a wheat crop is first taken, immediately succeeded by an autumn pulse crop, after which the land is fallowed for a year. The other system consists in separating the lands for the spring crop from those for the autumn, and then maintaining the separation. The spring crop lands give a wheat crop every spring, and lie fallow during the autumn season. The autumn lands lie fallow during the spring, and give a pulse or other crop in the rainy season.

"The method of cultivation is essentially the same everywhere, but the skill and labour used in carrying it out are liable to indefinite variation, partly due to the differing character of cultivators, partly to local circumstances, and partly to the rotation of crops in common use. Reduced to its barest elements, the system is to plough and cross-plough as often as possible, then harrow, then sow the seed through a drill attached to the plough, and then plough over. The number of ploughings varies greatly, once is enough for a Saiad, while a Jât thinks ten times hardly sufficient" (*Wheat Production and Trade*, 1883, 72).

Reaping. 680

REAPING, THRASHING, WINNOWING.—On these subjects Dr. Watt wrote:—"Reaping begins about the end of April, and the whole crop is in-gathered by the end of May or the beginning of June. The practice described in connection with the Montgomery district is fairly representative. The reapers are called *lâwa*, and belong chiefly to the class of village servants. But they do not confine themselves to their own village,—they go wherever they can find work. The usual pay is one *pâi* (seven seers) of grain, or four annas in cash per diem, with five sheaves. [This might be expressed as sixpence a day and the sheaves.] An ordinary reaper will cut down one *kanâl* and a half in the day; and a strong and practised hand will do as much as two *kanâls* (*kanâl* = half a rood). On an average five men will cut down an acre a day. Reaping is carried on during the moonlight nights in the last few hours before day if the straw is very dry, as the moisture of the night air is supposed to strengthen the stalk and prevent the ears falling off. If clouds gather, great efforts are made to get in the crops, as hail is much feared at this season; but hail is very uncommon in this district. As soon as the grain is cut it is stacked. The reaper gets his share when the crop has been thrashed and divided."

Thrashing 681

"There are several ways of thrashing. The most common is to yoke a number of bullocks together, fasten the one at the left hand of the line to a post, round which the straw to be thrashed is piled, and drive them round

CULTIVATION in the Panjáb.

Thrashing.

and round from right to left. Wheat and barley are, however, first thrashed with the *phalha*, or thrashing frame.

"A pair of bullocks are yoked to the *phalha* and driven round the stake about which the straw is heaped, there may be several *phalhas* at work one after the other, but there are never more than four One man is requir-
heap
quarter
When
ken up
with the pitchfork and thrown on one side, while the grain falls to the bottom.

as rapidly as possible, the owner generally sleeping beside his grain at night till it is all thrashed out."

Winnowing. 682

up by long
ly blowing
hing floor.

Storing. 683

STORING.—Wheat and other grains are stored in rooms of the cultivator's house, in large jar-like vessels made of mud, or wicker lined with mud, in large canvas bags called *théka*, which may hold as much as 50 to 100 maunds, or on prepared platforms in the open, carefully covered over and surrounded by a trench or hedge. Storing on the earthen floors of rooms or in mud vessels naturally tends to increase the amount of impurity.

Yield. 684

In the final wheat crop report for 1888-89 the outturn is estimated to

land, 303 seers=7.5 maunds, and for dry land dependent on rain, 222 seers =5·55 maunds. The total outturn was somewhat over the average of the precedin districts
with the na, 11·2
maunds ar, 10·2
maunds r, Simla,
Kangra, elow the
average, These
figures, it a crop

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in Sind. much above the average in two districts, above the average in sixteen districts, average in eleven districts, and below the average in no district.

SIND.

SIND. 685 References.—*Director, Land Rec. & Agri., Bombay, Reports; Reports of Hyderabad Experimental Farm; Govt. of Ind., Wheat Product & Trade in India, 1878, 1883, 1886; Forbes Watson, Rept. on Indian Wheat, 1879; Gazetteer of Sind.*

Very little of a special character can be said regarding the Sind wheats and wheat cultivation. In every feature Sind may be said to be intermediate between Bombay and the Panjáb. In certain parts of the country the methods of cultivation, the nature of the soil, and the character of the wheats are similar to those in the Panjáb, but in other parts of the province an approximation is seen to the wheats of Northern Bombay. The Sind wheats are generally pronounced superior to those of Bombay, and possess a larger proportion of soft white forms. The delta wheats are, however, specially liable to rust. Most of the Sind wheats are, as in the Panjáb, repeatedly watered or flooded during their growth. A dry crop (*see* the remarks under Bombay and Central Provinces) is, however, raised on lands that are inundated during the rains. On the water subsiding, these *band-baráni* soils are repeatedly ploughed, and the crop sown, no further watering being necessary.

Area. 686 Conf. with p. 94. Area.—The area under wheat in this province shows little alteration during the past sixteen years, and has, if anything, fallen off. Thus, during the five years ending 1877-78, it averaged in British districts 273,000 acres, in that ending 1882-83, 297,000 acres, and in that ending 1887-88, 227,000 acres, while in 1888-89 it amounted to only 234,483 acres. The average of four years from 1884-85 is 249,512 acres. The distribution of the area during the past year was as follows:—

District.	Irrigated.	Unirrigated.	Total.
Karáchi	28,554	...	28,554
Hyderabad	29,324	2,343	31,667
Shikárpur	138,811	...	138,811
Upper Sind Frontier	14,458	...	14,458
Thar and Párkar	Not	available.	20,993
Grand Total	...	...	234,483

In addition to the above, 32,438 acres are said, in the final crop report for 1888-89, to have been under wheat in the Native States of Khairpur, or a little under the average. The areas in Karáchi, Shikárpur, and the Upper Sind Frontier show a decided falling off, due to low inundation and scanty winter rain. In Hyderabad and Thar and Párkar the area was over the average of the preceding five years.

Races. 687 Races.—The varieties of wheat grown on the Hyderabad farm, Sind, have included most of the commoner kinds grown in the province, and have been classified as follows by Mr. Strachan, the Superintendent.

Soft White. 688

Class I.—Soft White.

Popri.—Flat, broad, short, club-like awnless heads, with roundish grain, short straw, and white husk.

Thori or Bhávalpuri.—Long, loosely packed, nearly square, dark-brown awnless heads, with round long grain, long straw, and rough brownish dark yellow husk.

CULTIVATION in Sind.

Races.

Soft White.

Class II.—Soft Red.

Soft Red. 689

very
ariety

husk,

Class III.—Hard White.

Hard White. 690

g upwards to a point. It has white

flat heads, with mostly black 6 to 8
white husk, and very large, long and

which is not a constant character, this variety is the same as the Sind variety called *Káhno*.

Class IV.—Hard Red.

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CULTIVATION in Sind.

for the crop forecasts, which was about 50,000 acres too large, the actual acre outturn may also have been overestimated. The average acre outturn for the four years ending 1887-88 amounted to just a little under 8 maunds.

Crop Experiments 694

CROP EXPERIMENTS.—A long series of experiments has been carried out at the Hyderabad farm for the purpose of ascertaining the suitability of several foreign wheats and wheats from other parts of India for cultivation in Sind, also to ascertain the relative merits of different rotations and of the **Lois Weedon** system of alternate fallows. English and Australian wheats have been thoroughly tested, but with very poor results, and in 1887-88 the Director of Land Records and Agriculture remarks:—"It is questionable whether there is any use in attempting the growth of foreign wheats. The Indian varieties supply ample material for improvement."

Though the **Lois Weedon** system has shown its superiority over the rotation and continuous systems on the Bhadgaon Farm (see p. 133), it has not done so at Hyderabad, where wheat in rotation has all along occupied the first place. A large quantity of hand-picked selected seed has been issued to cultivators in the province with excellent results.

Central India and Rajputana. 695

CENTRAL INDIA AND RAJPUTANA.

References.—*Agri. Statistics, Br. Ind., for several years; Govt. of Ind. Wheat Production & Trade in India, 1879, 1883, 1886; Rajputana Gazetteer, 1/6, 128, 254, 255, 279.*

There is little occasion to dwell upon this province. In climate and soil it closely approaches to the Panjáb, and its wheats are, accordingly, similar. The Commissioner of Ajmir-Merwara writes that the Natives invariably select the best lands for their wheat, generally that in the neighbourhood of a tank or well, from which it may be irrigated. The soil is of a light, sandy loam, unlike the stiff loams on which wheat is grown in England.

To obtain a full crop, the land is fallowed during the rainy season (June to September); during this period it is ploughed two or three times a month to a depth of 4 inches. At the close of the rains a heavy plank is drawn over the field, which serves the purpose of a roller in pulverising the surface, and also prevents the moisture escaping. The sowing season begins about October 25, and lasts till the end of November, the crop being reaped in April. The quantity sown is about 2 bushels to the acre, and, if manured and irrigated, the yield is about 34 bushels. When unmanured and unirrigated, the yield is perhaps not more than 7 bushels. If no winter rain falls the crop is irrigated three or four times.

Area. 696 *Conf. with p. 94.*

AREA.—The average area under the crop during the four years ending 1887-88 is returned as 1,542,000 acres in Rájputána; 15,000 acres in Ajmir, and 2,617,000 in Central India, or a total of 4,174,000 acres. In 1888-89, the area in Rájputána is returned at 1,641,994 acres, an increase on the average, while those in Ajmir and Central India are estimated to be average.

Outturn. 697

OUTTURN.—The average outturn for the same four years is estimated at 1,08,92,000 maunds for Rájputána, 1,06,400 maunds for Ajmir, and 1,44,20,000 maunds for Central India, or a total of 2,54,18,400 maunds. These figures represent an average acre yield for the whole of Rájputána and Central India of a little over 6 maunds to the acre. In 1888-89, the figures estimated for Ajmir and Central India are the same as those of the average, but though the area in Rájputana is returned as higher the outturn is lower, *viz.*, 1,06,84,200 maunds.

BOMBAY.

CULTIVATION in Bombay.

Bombay. 698

Th
wheat
comparison with wheat in the Panjáb and North-West Provinces, but

Soils. 699

Broach. 700

Nasik. 701

n hilly undulations, and yields good
and black and the light brown soils
often yield no crops at all when the
rain is scanty.

"In the *Belgaum* district of the Karnátik, there are said to be two soils, Belgaum. 702
red and black. The red soils are primary soils—that is, they are the di-
ie iron-bearing rocks. This soil is
border; but it occasionally occurs
are secondary soils—that is, they are
of organic matter. The black soil

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Cultivation of Wheat

CULTIVATION In Bombay.

Area. 703

Conf. with p. 94.

covers most of the plains country, and is best suited for the growth of cotton, Indian millet, wheat, and gram.

AREA AND IRRIGATION.—The areas occupied by wheat, in the British districts of Bombay, during the year 1888-89 were as follows:—

District.	Irrigated.	Unirrigated.	Total.
I. *Gujarát.*	Acres.	Acres.	Acres.
Ahmedabad	40,288	143,369	183,657
Kaira	11,870	19,167	31,037
Panch Mahals	422	577	999
Broach	112	15,079	15,191
Surat	20	11,670	11,690
II. *Deccan.*			
Khándesh	14,990	318,129	333,119
Násik	28,562	349,711	378,273
Ahmednagar	31,114	246,018	277,132
Poona	24,556	92,950	117,506
Sholápur	31,722	21,441	53,163
Sátára	24,571	44,732	69,303
III. *Karnátak.*			
Belgaum	2,797	121,802	124,599
Bijápur	1,894	204,005	205,899
Dhárwár	24	276,711	276,735
IV. *Konkan.*			
Thána	...	144	144
Kolába	No wheat grown.		
Ratnagiri	No wheat grown.		
Kánara	No wheat grown.		
TOTAL	212,942	1,865,505	2,078,447

It is an interesting fact in connection with the above that only 144 acres are grown in the Konkan, and that this should consist of 143 acres cultivated during the *kharíf* season, and 1 during the *rabí*. Throughout the rest of the presidency wheat is, as elsewhere, a *rabí* crop, with the exception of 2 acres in Broach returned as under wheat in the *kharíf*.

The area during the year was considerably lower than that of 1887-88, and about equal to the average for the four years ending with that year, *viz.*, 2,037,281 acres. The decrease occurred chiefly in Gujárat and the Deccan, while in the Karnátak a general increase occurred. The Officiating Director of Land Records and Agriculture, in his report for the year, remarks on this subject:—"The continuous increase in wheat in the Karnátak, followed by a corresponding decrease in cotton, give grounds for a belief that, as noticed in last report, wheat is here probably displacing cotton,—a result partly attributable to the increased demand for the staple for export, and partly to the facility afforded for export by the introduction of the Southern Mahratta Railway."

In addition to the area under wheat in British Districts, 600,975 acres (taken as 601,000 in the general table of area) are returned as having been devoted to the crop in Native States. The shares in each were,—Baroda, 97,129 acres; Kathiawar, 223,047; Cutch, 44,550; other Gujárat States, 91,156; Satara jagirs, 21,248 acres; Akalkot, 6,003; Kolhapur, 14,483

acres; other Southern
considerably over that f
for previous years, viz.,
the crop, in Kathiawar n

Races.
704

English pedigree wheats are little more than records of failure, but the results of experiments made during the past five years with seed from the North-West Provinces are much more satisfactory. These trials were conducted at the Bhadgaon Experimental Farm, where it was found that the northern stock is much more prolific, yields more straw to an equal amount of grain, and produces a heavier crop than *bansi*, the common race cultivated in the district.

It has long been held by native cultivators all over India that the colour and consistence of wheat are more dependent upon climate, soils, and

Conf. with p. 130.

... systems, both in unirrigated and in irrigated plots.

It is impossible to give a list of all the races distinguished in the

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in Bombay.

Races.

various districts of the presidency by distinct vernacular names, nor indeed would such an enumeration prove of much practical value. All four classes are represented, but, as already stated, hard wheats are predominant. The great majority of those submitted to Dr. Forbes Watson would appear to have been hard white and hard red, since, out of 139 samples, 60 belonged to the former, and 61 to the latter, while only 13 were soft red and 5 soft white. The accompanying list of those selected from the samples as of greatest commercial value may be of interest :—

CLASS.	District.	Name.	Weight per bushel.	Price per quarter.	REMARKS.
HARD WHITE	Bhownuggur .	Hasia . .	60½	40 6	Long berried.
	Khándesh .	Kali Kusal .	61	42 6	Ditto.
	Ditto . .	Bansi . .	62½	42 6	Very fine.
	Násick . .	Yellow Banshi .	57	40 0	Finest of all, but weevilled.
	Punch Mahals .	Daudkhani .	62	42 0	Large berried.
	Ditto . .	Kathe Malvi .	61	40 6	
	Dhárwár . .	......	58	40 6	
	Poona . .	Bakshi Gahu .	62	41 0	Large berried, finest kind grown.
	Sátára . .	Buxi . .	60	40 6	Very fine.
SOFT RED .	Bhownuggur .	Vajia . .	58	40 6	Semi-hard.
		Patalia . .	58	40 6	Ditto.
		Ditto . .	59½	40 6	Ditto.

Spelt Wheat.
705
Conf. with pp. 100, 129, 135.

One of the most interesting, though perhaps least important commercially, of Bombay wheats, is the "spelt," which, there is now no doubt, is regularly cultivated, and probab y constitutes the whole of the *kharíf* crop mentioned above. Dr. Watt drew attention to this form in his paper frequently quoted above. "In nearly every report," he writes, "a form of wheat known as *khaplé* is described as a wheat that requires much watering. There seems little doubt from the brief descriptions that have appeared of this wheat that it is a form of spelt-wheat. We have seen spelt-wheat sent from the mountains of South India, but have always suspected that it may have probably been a modern introduction. Here, however, there would appear to be no grounds for such an opinion. It is grown all over the Western Presidency, and it is quite possible its area of cultivation may extend to Southern India" After commenting on what has been shewn above in the chapter on Habitat, *viz.*, that this question has an important bearing on the theories generally held regarding the origin of wheat, Dr. Watt continues: "By way of showing that there is at least a strong probability that the *khaplé* wheat of Bombay is a form of spelt, we may

Khaple.
706

reproduce one or two passages regarding it. In the *Poona Gazetteer* the following occurs:—'*Kaphlé* is the wheat usually grown in gardens. It is

very hardy. It owes its name to the fact that the grain cannot be separated from the husk without pounding. It is sown as a second or *dusota* crop in January or February on irrigated land after *bájri*, maize, tobacco, chillies, or wheat, with good results."

CULTIVATION in Bombay.

Races. Khaple.

"We have here in itself a fact of very considerable interest—namely, that, as with rice, we *do* actually possess in India a wheat that may be grown as an early *kharif* crop. Were there no other points of attraction this alone is well worthy of being followed up and put to a final test. It is much to be regretted that, while volumes have been written upon every side issue of the wheat trade, no scientific investigation has been instituted into the subject of the varieties of wheat grown in India. Such an inquiry would doubtless lead to decided advances towards establishing the reasons for their peculiar adaptabilities. With such a knowledge, it would not be necessary to grope so much in the dark in the matter of efforts to introduce better varieties from one part of India to another. We have not, however, at present the means at our disposal to verify the suggestion contained in the above explanation of the *khaplé* form of Bombay wheat, and as our readers may not have access to the numerous records in which brief passages occur regarding it, we may extract one or two more passages.

Scientific Investigation necessary. 707

"In the *Ahmednagar Gazetteer* it is stated: '*Khaplé*, also called *jod*, is very hardy; but requires pounding to separate the husk.' Of Kolhapur it is said, '*Khaplé* is largely grown in watered lands as a crop alternately with sugar-cane. The grain is coated with an adhering husk, which cannot be separated without pounding.'"

The above supposition that *khaplé* is T. speltum has been confirmed by Mr. E. O. Ozanne, Director of Land Records and Agriculture in Bombay, who, in a letter to the Collector of Hyderabad, dated August 1887, writes, "Considerable pains were taken to differentiate the varieties—local and imported—of wheat. The variety called *pamban* is clearly the *khaplé* or *jod* of the Deccan, and is T. speltum" (*Conf.* Sind p. 1229).

Spelt wheat. *Conf. with pp. 100, 129, 134.* 708

Method of Cultivation.—The system pursued in growing the finer wheats is briefly conveyed in the following extract:—*Bakshi* is the best kind of wheat raised in the Deccan and Southern Máratha country. It is either black-bearded or straw-colour-bearded. The grain is large and hard and contains a large proportion of gluten. This wheat, not being hardy, is not largely cultivated. The land is ploughed twice, once lengthways and once cross-ways, with a six- or eight-bullock plough, according to the nature of the soil. The land is then harrowed six times, thrice with a four-bullock harrow and thrice with a two-bullock harrow, and then sown with wheat. This is all that is considered necessary. It is not customary to raise wheat on the same lands annually. The rotation generally adopted on dry crop land is as follows: first year *jowari*, second year *bájri*, third year wheat. On garden lands two crops are annually raised as follow:—

Method. 709

1st year.	2nd year.	3rd year.
1st crop *bájri*.	1st crop *bájri*.	1st crop *bájri*
2nd crop wheat.	2nd crop gram.	2nd crop wheat.

Instead of wheat or gram for a second crop, onions, potatoes, etc., are sometimes raised.

This system may well bear comparison with the careful methods pursued in the Panjáb and Northern India generally, but the method followed in Bombay is frequently of a much more careless nature. Thus it is reported of Khandesh:—"Before sowing with wheat, the ground is

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CULTIVATION in Bombay.

Method.

never ploughed, only three or four times laid open with the hoe to the sun, rain, and wind. If the ground is so damp that the clay sticks in balls sowing begins in October or November, and in some of the Tapti Valley districts as early as September. The allowance of seed is from forty-five to seventy-five pounds an acre. A shower or two when the crop is shooting is useful, though by no means necessary. With cool seasonable weather and heavy dews, wheat flourishes without rain."

One finds reports of similar different systems in each district throughout the Presidency, according to the kind of wheat grown. Thus in Ahmedabad it is reported that the finer kinds known as *chasia* are grown in light black soil, which is kept fallow and ploughed four times before the seed is sown. Sowing is commenced in the end of October and the harvest is in April. No crop precedes or succeeds it, but occasionally it is used as a substitute for cotton when that crop fails. The inferior kinds, *wadina* or *wajia*, are sown on irrigated light sandy soil, following rice, *jowári* or *bajrí*. One hundred and sixty pounds are required to sow an acre, while in the case of *chasia* 84 are deemed sufficient. The crop is sown in December, and fewer ploughings are given. In Kaira three sorts are said to be grown, *daudkhana* or *dudhia, dhola* or *kathia*, and *bhalia* or *wajia*. The first, a very superior soft white wheat (*Conf.* pp. 197-98), is grown on rich black soil only, the second is an inferior hard red or white grain, the last a mixture of the two. *Dudhia* we find again is cultivated with great care; the ground is allowed to lie fallow before and after the crop, it is manured if necessary, and ploughed from three to ten times. In the Panch Mahals wheat is generally sown as a second crop after rice or maize, and its rearing receives very little care at the hands of the cultivator In Broach, on the other hand, a system of alternate fallow is followed and manure is sometimes used. In Reports on Nasik it is stated that in certain parts of the district wheat follows *bajrí, kulthí*, or linseed, occasionally it is grown on dry crop land which is manured for it, in other localities it is grown on manured garden lands. In the latter case it follows *konde*, and *tag*, hemp (*Wheat Prod. & Trade of Ind.*, *1879*).

Diseases. 710

DISEASES.—Wheat in Bombay, as in other localities in India, is subject to the attacks of rust, known in this province as *geru, gerwar*, or *jeru*. The cultivators state that it attacks crops only when they are planted on irrigated land, and that it is favoured by showery or cold weather during the growth of the plant. *Chasia* wheat is said in the reports on Ahmedabad to suffer from frost, *kapadi* (an insect pest), and other enemies (*Conf.* **Fungi and Fungoid Pests**, *III.*, *457*, also **Pests, Insects**, *VI.*, *Pt. I.*, *145*).

Yield. 711

YIELD AND PROFIT OF CULTIVATION.—The total production for 1888-89 is, in the Final Crop Report for the province, estimated on an assumed acreage of 2,654,342 (considerably above the actual) to have been 588,472 tons, or 1,64,77,216 maunds. Of this amount, 298,492 tons were estimated to be produced from dry, 289,980 tons from irrigated, crops. The total average outturn on these figures would be 6·2 maunds to the acre; the average for irrigated lands 13 maunds, for dry lands only 4·1 maunds to the acre. This outturn cannot, however, be accepted as typical, since it had decreased on that of the former year, in all districts and states except the Gujárat States. The diminution was especially marked in the Deccan, where the total yield amounted to only ⅓ of the former year's produce. It is, however, probable that the figures returned are considerably lower than the actuals, at least for dry land crops.

Profit. 712

The cost and profit of cultivation were worked out by several experiments in 1872. In six of the experiments made in good and over average soils, it was found that, without irrigation or manure, an acre yielded from 420 to 1,476 pounds. This outturn, calculated at prices about twenty

five per cent. below current market quotation at the time of the experiment, gave the following results :— CULTIVATION in Bombay.

Statement showing the result of Wheat cultivation. Profit. 713

Cost of cultivation in Rupees.				Outturn per acre in Pounds.		Value of crop per acre.		Net profit.	
Seed.	Ploughing to harvesting	Rental.	Total.	Grain.	Straw				
R	R	R a. p.	R a. p.			R a. p.	£ s. d.	R a p.	£ s d.
2	6¼	4 0 6	12 4 6	432	368	20 11 4	2 1 5	8 6 10	0 16 10½
2	6¼	3 2 6	11 6 6	416	336	16 7 0	1 12 10½	5 0 6	0 10 0¾
2	6¼	3 11 0	11 15 0	1,476	1,846	59 15 4	5 19 11	48 0 4	4 16 0½
2	6¼	5 12 6	14 0 6	620	1,104	30 2 0	3 0 3	16 1 6	1 12 2¼
2	6¼	4 1 0	12 5 0	420	560	19 4 0	1 18 6	6 15 0	0 13 10½
2	6¼	5 14 6	14 2 6	684	880	31 2 8	3 2 4	17 0 2	1 14 0¼

NORTH-WEST PROVINCES AND OUDH.

N.-W. P. & OUDH. 714

much attention and
In addition to the
mes of the Govern-
ibject of cultivation
Duthie & Fuller on
bearings formed, in
urable Mr. W. C.

Soils. 715

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in the N.-W. P. & Oudh.

Soils.

usár plains, are especially productive and suitable for wheat. Manure is applied to the better class of wheat-fields generally every second or third year, though in quantities which would sound ridiculously small to the English farmer, 4 tons (=100 maunds nearly) being about the average. Land is occasionally prepared by herding sheep in the fields. This same practice prevails in the Panjáb, and a case is recorded of a prosecution because a flock of sheep, which for years had herded on a particular farm, were by the owner taken to a neighbouring farm instead. A curious habit also prevails in Northern India of herding sheep, and even cattle, on the field while the crop is sprouting so as to top-manure the soil and cut down too rapid growth.

Area. 716 *Conf. with p. 94.*

AREA.—In the general table of area for all India the figures given in the case of the North-West Provinces and Oudh are mere estimates, based on the degree of cultivation in later years and probably considerably over-estimate the actual area. From this cause cultivation shews very little development in the case of the North-West Provinces, though in Oudh it is shown to have undergone considerable expansion. Owing to the want of figures previous to 1879, it is impossible to make an actual comparison, but Mr. Benett, in the paper above referred to, believes the expansion even in the North-West Provinces to have been rapid and extensive after that year. "Since 1879," he writes, "the area under wheat has been steadily increasing, and there is nothing to show that its limit has even nearly been reached. The next table compares the areas under each class of cultivation in 1879 and 1883, in the North-West Provinces only; no comparison is possible for Oudh :—

	Pure wet.	Pure dry.	Mixed wet.	Mixed dry.	Total area under wheat in all districts except Kumaon Division.	Total area under all crops in 28 districts.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1883 . .	2,223,634	1,541,297	756,278	1,700,011	6,221,220	21,334,803
1879 . .	1,756,876	1,517,691	640,954	1,449,995	5,365,516	20,402,718
Increase in five years . .	446,758	23,606	115,324	250,016	855,704	932,085
Percentage increase .	27	2	18	17	16	5

"The first fact brought out by this table is that in the North-West Provinces alone, excluding Oudh, nearly a million acres have been brought under wheat cultivation within the last five years. And this has not been to the detriment of other crops, for we find that the increase in the cultivated area in twenty-eight out of the thirty-four districts has been more than the increase under wheat only. Then we find that, although the area under crops has increased, the main increase has been under wheat, which is the crop which requires the most careful cultivation, the increase having been 16 per cent. in the case of wheat, while it has been only 2 per cent. in the case of all other crops, or nearly eight times in the first case what it has been in the second. Finally, more than half the increase under

in the N.-W. Provinces and Oudh. (*J. Murray.*) **TRITICUM sativum.**

in the past year (1888-89) the cultivated area under pure wheat dropped by some 330,000 acres, from the average of the previous five years. The area in the United Provinces was 104,509 acres below the average for the past ten years, which is 3,566,618 acres for the North-West Provinces and 1,507,091 for Oudh.

In addition to the above areas there is, as shown by Mr. Benett's figures, an extent of some 2,500,000 acres under mixed wheat, wheat-gram, wheat-barley, etc., in the North-West Provinces; an area which has been excluded from consideration owing to the varying nature and uncertainty of its outturn of wheat.

During the past year the area under pure wheat was distributed in the proportions shown below:—

Division.	Irrigated	Unirrigated.	Total.
Meerut	542,353	514,933	1,057,280
Agra	348,543	87,217	435,767
Rohilkhand	176,019	753,031	929,050
Allahabad	173,685	36,372	210,056
Benares	356,927	166,350	523,279
Jhansi	23,145	56,135	79,280
Kumaon	21,679	222,890	244,567
Total N.-W. P.	1,642,351	1,836,928	3,479,279
Lucknow	242,612	43,078	285,690
Sitapur	251,985	178,344	430,329
Fyzabad	294,341	243,776	538,117
Rai Bareli	224,427	11,358	235,785
Total Oudh	1,013,365	476,556	1,489,921
GRAND TOTAL	2,655,716	2,313,484	4,969,200

Lucknow, and Rai Bareli, and that, taking the United Provinces generally

Races. 717

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in the N.-W. P. & Oudh.

Races.

strongly to the importance of the cultivation and the lengthened period over which it must have extended. Here, as elsewhere, the forms may be conveniently classified into red and white, with the subordinate characters of hardness and softness. Hard wheats are said to be most highly valued by Natives, who consider them more wholesome for general consumption. A good deal has been written above in the chapter on RACES generally on the characters of the North-West Provinces wheats. It may, however, be repeated that *daudi* or *daudia* is, perhaps, the finest kind, and has been pronounced equal in value to the finest wheats in the English market. *Mundia*, *mundwa*, or *murilia* (*lit.* shaved) is a name generally applied to another class of white soft wheat of good quality, so designated from being beardless. In the western districts of the Provinces, hard white wheats are generally known as *badha* or *barha*; they are, however, much less frequently cultivated than the soft or mixed forms. *Pissi* is said generally to denote a soft red wheat, and *kathia* or *lallia*, a hard red wheat. *Gangajali* (a common term in the Bombay market) is, according to the authors of *Field & Garden Crops*, applied to many varieties, and its only general application appears to be to mixed red and white hard wheats. A curious round-berried form, which somewhat resembles peal barley, is called *paighambari*, and is said to have been an introduction from Arabia (*Field & Garden Crops*, 2).

With these preliminary remarks, a list of the samples valued in Dr. Watson's report may be given, as in the case of other Provinces:—

Class.	District.	Name.	Weight per Bushel.	Value per Quarter	REMARKS.
				R a.	
Soft White.	Azimgarh	Daudi	61	46 0	
	Benares	Daudia	...	46 0	
	Basti	Gangajali	...	45 0	
	Banda	Pisi gangajali	...	47 0	
	Cawnpore	Muria	...	48 0	
	Ditto	Anokha	...	47 0	
	Ditto	Desi	...	46 0	Large berry.
	Ditto	Mudia	...	44 6	Fine drop wheat, probably 64 lb.
	Futtehpore	Pisi awwal	...	46 0	
	Ditto	Muria	...	45 0	
	Pertabghar	Mundwa	62½	47 0	Like Californian.
	Ditto	Setwa	60	46 6	
	Ditto	Mundia	...	46 0	
	Bharaich	Daudi	61	46 6	Ditto.
	Ditto	Sambodhwa	...	46 0	
	Ditto	Sandhua	...	46 0	
	Gonda	Daudi	...	45 6	
	Unao	Saman	...	48 0	
	Ditto	Marua	...	46 0	Ditto.
	Ditto	Ditto	...	46 0	Ditto.
	Ditto	Safeda	...	45 0	
	Kheri	Sitia	60½	45 0	Like Danzig, but dirty.
	Sitapur	Mundia	61	46 0	Like Californian.
	Ditto	Muria	...	46 0	
	Lalitpur	Pisi duem	...	45 0	
	Etah	Mundia	62	47 0	Like Australian.
	Ditto	Sambharia	...	46 0	Like Californian.
	Ditto	Ratta	...	46 0	Ditto.

in the N.-W. Provinces and Oudh. (*J. Murray*) TRITICUM sativum.

CULTIVATION in the N.-W. P. & Oudh.

Races.

Class.	District.	Name.	Weight per Bushel	Value per Quarter.		Remarks.
				R	a.	
Soft White—(*contd.*).	Muttra	Safeda	...	46	6	Like Californian.
	Mainpuri	Sambharia	...	47	0	Ditto.
	Ditto	......		46	6	Ditto.
	Bulandshahr	Safed	63	48	0	Like Australian.
	Ditto	Gajar	63½	47	0	Like Californian
	Ditto	Safed	...	46	6	Ditto.
	Ditto	Mendha	62½	46	0	Ditto.
	Ditto	Gajar	.	46	0	
	Ditto	Rutta	62	45	6	
	Ditto	Ruta	63	45	0	
	Ditto	Munia	...	45	0	Like pearl barley.
	Dehra Doon	Mihirta	..	45	0	
	Meerut	Safed	62	48	0	Like Californian
	Ditto	Ditto	...	48	0	Ditto.
	Ditto	Monda	62	47	0	Ditto.
	Ditto	Muria	...	45	6	
	Muzaffarnagar	Safeda	..	46	0	
	Saharanpur	Monda	62½	46	6	
	Ditto	Muria	...	45	0	
	Bareilly	Sambharia	...	46	0	
	Ditto	Pisia	60	46	0	
	Ditto	Khatia	..	45	0	
	Budaon	Bhambria	.	46	6	
	Ditto	Muria	61	46	6	
	Ditto	Ratua	61	46	0	
	Ditto	Rai munea	...	45	0	Like pearl barley.
	Moradabad	Muria awwal	62	47	0	Ditto.
	Ditto	Mundia	...	46	0	Small berry.
	Ditto	Mandwa kada	...	46	0	
	Ditto	Ditto	...	45	6	
	Ditto	Muria safed	...	45	0	
Hard White	Gonda	Daudi	63	41	0	Mostly hard.
	Barabanki	Murua	62	41	0	Mixed hard.
	Lucknow	Tamla	64½	42	6	
	Unao	Samanbargehuna	..	41	0	Long berried.
	Etah	Bhidia	61	40	6	Long berried, like Kubanca.
	Mainpuri	Anokha	60½	42	0	Long berried.
	Ditto	Ditto	...	40	6	Ditto.
	Aligarh	Kathia	58	41	0	Ditto.
	Bulundshahr	Barha	...	42	0	Ditto.
	Ditto	*Ditto*	...	*40*	*6*	*Large berried.*
	Meerut	Ditto	61	41	0	Long berried.
	Ditto	Ditto	...	40	6	Ditto.
	Budaon	Ratua	...	40	6	Ditto.
	Shahjehanpur	Sambhari	60	40	6	
Soft Red	Azimgarh	Hurrah	63½	41	0	Small berried, semi-hard.
	Allahabad	Raksa	...	41	0	
	Cawnpore	Pisia	...	41	0	
	Jalaun	Pisia, red	61½	41	6	Large berried.
	Muttra	Lal	...	40	6	
	Bulandshahr	Gehun lal	62½	42	0	
	Meerut	Surkh	61½	41	0	Long berried.

TRITICUM sativum. **Cultivation of Wheat**

CULTIVATION in the N.-W. P. & Oudh.

Method. 718 METHOD.—There is very little of any special character to record under this heading. The crop is entirely *rabi*, being sown in the end of October or beginning of November, and cut in March and April. As a rule, it is only sown in land that has lain fallow during the preceding *kharif* (known as *chaumás* or *púral*); but in highly manured lands near village sites it occasionally follows maize, that crop being cut only six or eight weeks before the wheat is sown.

Seasons. 719

Rotation. 720 No particular rotation is known to be followed, but in tracts where cotton is widely grown, wheat is generally said to follow it—probably, however, merely because cotton in the *kharif*, like wheat in the *rabi*, is the crop which is principally grown on the best land of the village (*Field & Garden Crops*). In the Meerut district, a very elaborate rotation is observed, in which wheat is grown only twice in five years.

Mixtures. 721 Wheat, as already indicated in the chapter on area, is not only grown alone, but is also cultivated to a large extent mixed with barley (when it is termed *gojai*) or with gram (*gochana*, or *bríra*). The latter mixture is but little grown north of the Jumna, but in Bundelkhand it forms one of the principal and most characteristic crops. A wheat field usually contains some rape or mustard, sown either in parallel lines across the field or as a border. These flower in the beginning of February, before the wheat has begun to ripen. Linseed and *duán* (Eruca sativa) are also occasionally, though less commonly, sown in wheat fields.

Tillage. 722 "The number of ploughings varies within very wide limits, depending not only on the character of the locality and soil, but on the energy and leisure of the cultivator. Thus timely ploughings are reported as not uncommon in Gorakhpur, while two or three are held sufficient in the black soil of Bundelkhand. Eight ploughings may be taken as the average. It is essential that the land should be ploughed at the very commencement of the rains, so as to lie in open furrow and drink in the whole of the rain which falls. Indeed, the ploughing of wheat land is often held to take precedence of preparations for the *kharif* crops. The clods are crushed and a fine tilth (which is absolutely essential in most soils) created by dragging a flat log of wood (*mai*, *pátha*, or *henga*) across the field, the bullock driver standing on it to increase the weight.

Sowing. 723 "If the ground is very damp the seed is sometimes sown broadcast and ploughed in, when it is not buried more than one inch below the surface, and is less likely to rot if buried deeply. But the two commonest methods of sowing are (1), by simply following the plough and dropping the seed into the furrow made by it, the seed being covered by the earth thrown up by the next furrow, and (2), by dropping the seed down a bamboo fastened to the plough stilt. It is said that the advantage of each practice varies with the condition of the soil, the former being best when the soil is very moist, and the latter when the soil has somewhat dried. But as a matter of fact the practices are strictly localized to tracts within which either one or the other is exclusively followed. The amount of seed used per acre varies from 100 to 140lb. After the sowing is completed the field is either left in furrow, or is smoothed with the clod-crusher, the latter practice being said to save irrigation by enabling the water to spread quicker over the surface. The field is then divided off into irrigation beds by scraping up little banks of earth with a wooden shovel."

The proportion of seed employed is very high, much higher than the average in most other localities. This fact has been frequently urged against the advisability of encouraging wheat cultivation in India. The poorer cultivators have to buy from the merchant (or rather get the grain on loan at high interest collected at harvest), and are at the same time compelled to accept whatever seed the trader of the district chances to have

in stock. A very extensive correspondence has passed on this subject between the various Governments, and attempts have been made to disseminate seed of good stock from the Government experimental farms. But these measures nave had very little permanent effect on the general character of wheat grown. As already shown, in the paragraphs on Bom- CULTIVATION in the N. W. P. & Oudh. Sowing.

to his old stock.

IRRIGATION.—"If the soil is sufficiently moist in October to allow of the Irrigation. 724

	Meerut Division.	Rohilkhand Division.	Agra Division.	Allahabad Division, excluding Jaunpur District.	Benares Division, including Basti and Gorakhpur Districts only.	Jhansi Division.	Kumaun Division, including Tarai District only.
Normal rainfall between November 1st and May 31st*	5'56	4 73	2'55	2'26	3 55	2'06	6 53
Percentage of irrigated wheat to total . . .	53'1	20'1	74'3	63'7	71'0	27'4	32 7

Should the soil be too dry for germination, a watering (called *paleo*) paratively easy matter in y in districts which rely Rae Bareli in the *rabi*

surface soil as by removing the weeds, but this is by no means a common practice, and if the land be in clear condition when sown, it is not as a rule weeded. The custom is reported from Bahraich District, and may prevail in other parts of the Provinces, of topping wheat which shows an undue

* Calculated from the normal rainfall at each district head-quarters in the Divisions.

Cultivation of Wheat

CULTIVATION in the N.-W. P. & Oudh.

tendency to run to leaf and stalk, by cutting down the upper portion of the plants with a sickle. This is done when the crop is about 3 feet high, and care is taken not to cut down so low as to damage the ears which have formed in the leaf-covers, but not yet emerged. A similar custom obtains in parts of the Panjáb, where, however, the young plant is fed down by sheep.

Harvesting. 725 "The crop when ripe is cut down by sickles and carried to the threshing floor, where, after having been allowed to dry for several days, it is trodden out by bullocks, and winnowed by the simple expedient of exposing the grain and chaff to the wind by pouring them out of a basket held some 5 feet from the ground. Should there be no wind, an artificial breeze is made by agitating a cloth, but this adds greatly to the expense and trouble, and is in no way an efficient substitute for the English winnower" (*Field & Garden Crops*).

Cost. 726 COST.—Messrs. Duthie & Fuller have gone into the question of cost of production with much care. The results of their calculations may be stated briefly :—

	R	a.	p.
Expenditure for labour and seed	16	0	0
Irrigation, and labour in watering	5	7	0
Manure (100 maunds)	3	0	0
Rent of land (second class)	7	0	0
TOTAL	31	7	0

It would be useless to attempt an estimation of the average profit derived, since this depends so largely on the price obtained, which has been shown elsewhere to be an extremely variable factor.

Outturn. 727 It was estimated by the Government of India in March 1884 in a circular on the subject, that the area under wheat, mixed and unmixed, in the Provinces, was 6,200,000 acres, and that the average production per acre was 13 bushels or $9\frac{6}{8}$ maunds per acre. Mr. Benett, criticising these figures in December of the same year, states that, in his opinion, they are under-estimates, since they are based on the supposition that more than half the area occupied by the crop is on third class lands, that is, lands that are inefficiently or carelessly cultivated. "But this," he writes, "is very far from being the case. Careless cultivation is less common with wheat than with any other kind of food crop, especially when it is sown unmixed. For the last three years careful experiments have been made on the Cawnpore Farm to ascertain the ordinary produce of wheat. The soil is poor, and the cultivation not superior than what is given by an ordinary skilled cultivator, either in point of manure or irrigation, while in the matters of ploughing and weeding it is probably inferior. The results have been as follows :—

	Area sown in acres.	Average produce of grain per acre in lb.
1882	16·8	1,390
1882	16·1	1,309
1884	17·6	1,453
Average of three years		1,384 or 23 bushels.

"(I have received the record of some very careful weighments done by Mr. Saunders, C.S., at Rae Bareli. He found the average of eight weighmen[illegible] [illegible]ated wheat to be 23·63, the lowest 11·81, and highest 36·2 bus[illegible] [illegible]cre. Of fourteen weighments of barley and wheat

CULTIVATION in the N.-W. P. & Oudh.

Outturn.

the average was 23·7, the lowest 19·73, and the highest 26·18 bushels to the acre.)

"A careful review of all the evidence then in existence led Mr. Fuller to state . . .

. . . at all, inferior . . . all classes of . . . as the average produce per acre on irrigated lands . . . these Provinces I feel that I am

. . . ed wheat is grown in the *tarai* . . . of Oudh. The extremely careful . . . Mr. Moens ascertained that the average produce in Bareilly was 12 maunds, or 16 bushels to the acre. As has been stated, wheat, even when unirrigated, is rarely sown on inferior soils, and to take the mean of the assumed produce on second and third class lands in the letter of the Government of India as the average production for all unirrigated wheat will be well within the mark. This is 12 bushels, or 9 maunds.

When wheat is sown as a mixture, it is, over the whole Provinces, about half the crop, and 10 bushels may be assumed for irrigated, and 6 for unirrigated land, as the average produce per acre.

"By applying the above produce rates to the area, we find the produce of the mean harvest of the last five years (1879—1883) for the North-Western Provinces and one year for Oudh to have been—

	Bushels.
Pure wet	62,096,584
,, dry	25,064,640
Mixed wet	9,074,190
,, dry	10,949,424
Total	107,184,838

or nearly three million tons. Before leaving the subject of produce it may be as well to remark that any comparison between English and Indian rates of produce with the view of discrediting Indian methods of agriculture is apt to be misleading. In England wheat has to compete with pasture, which is not the case here. Nearly every acre in this country is under . . . s of . . . be . . . wheat . . . it is doubtful whether the average outturn is much less than it is in England, and with the best classes of cultivators, such as *Kurmís* and *Káchhis*, it is probably at least as great."

. . . the estimates of Mr. Benett, . . . wheat, and 9 for unirrigated. . . . by Mr. Benett, at the Cawn- . . . y that the outturn accepted as . . . these Provinces is under rather . . . further estimates the proportion of wheat in mixed crops to be ⅘ths of the outturn of wheat-barley and ⅓rd of that of wheat-gram, except in the Allahabad and Jhansi Divisions where gram is the principal crop in the mixture, and the proportion of wheat is not much above ⅓rd. Mr. Benett's figure of ½ may, therefore, be practically assumed as a fair approximate for all mixed crops in the Provinces, and the average outturn of 20,000,000 bushels given above may

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CULTIVATION in the N.-W. P. & Oudh.

probably be accepted as very near the average production of mixed crops. The outturn of straw varies in weight between half as much again and twice as much as that of grain. When crushed into small pieces, as it is in the process of treading out the grain, it forms an important cattle-fodder. During the past year, 1888-89, the area and outturn were both very much lower than in any previous year since 1884. Accepting the standard of full average outturn adopted in the wheat forecasts (an average much lower than that independently estimated by Mr. Benett, Mr. Fuller, and other authorities), the total outturn for the year is, in the final wheat report, estimated at 1,440,000 tons. This is based on the assumption that the condition of the crop varied from 50 to 25 per cent. below the average, and implies an average yield of only a little over 8 maunds per acre.

Experiments. 728

CROP EXPERIMENTS.—The following were selected for reproduction in the Government of India Report on Wheat Production and Trade in India, in 1883:—Fairly accurate experiments were carried out in 1879-80 with the following main results. The average cost per acre was found to be—

	R	a.	p.
Seed	2	0	0
Ploughing, clod-crushing, sowing, weeding, and reaping .	6	8	3
Rent	6	4	0
Irrigation from canal	3	12	0
TOTAL .	18	8	3

The labour was not under very careful supervision, and would cost a cultivator next to nothing, as it would be supplied almost entirely by himself and his family.

The price of manure varied with the kind and quantity given to each experimental plot. The net results were as follows:—

	Total cost of all kinds.	Outturn in bushels.	Value.
	R a. p.		R a. p.
Bone superphosphate, 2 maunds . . .	27 12 9	27·1	49 10 3
,, ,, 3½ ,, ...	31 4 5	31·5	58 0 11
Dissolved guano 1⅜ ,, ...	34 6 5	23·7	43 11 2
,, ,, 2 ,, ...	39 9 7	29·6	55 0 8
Green soiling with indigo	30 8 3	23·8	47 0 3
No manure	19 12 3	19·5	35 4 7

Each one of these plots had been irrigated twice. On unirrigated land the produce of grain on four plots averaged little more than 10 bushels to the acre,—that is to say, it was considerably less than half what was obtained from land which had had only two waterings.

The result of experiments with thick and thin sowing on land dealt with similarly with regard to ploughing, watering, and manure, was as follows:—Sixteen pounds of the finest white country wheat to the acre produced a crop of 1,206lb (or 20 bushels) at a cost of R25-6-9, while 116lb of seed (the ordinary native allowance) produced 1,626lb (or more than 27 bushels) at a cost of R27-0-9. The result showed that, though the rate of return to seed was far higher with thin sowing, thick sowing was the more profitable operation. In the succeeding year experiments were carried

out on similar
employed. The results ...

Name.	Cost per acre of all kinds	Crop in bushels.	Value.
	R a p.		R a p.
Green soiling	28 13 0	30	58 4 3
Cattle-dung, 240 maunds	33 7 0	21 7	42 12 8
" " plus 240lb gypsum	38 11 0	20 7	41 0 5
Ashes of 240 maunds dung	33 7 0	18·6	36 11 1
Poudrette, 240 maunds	33 7 0	31·4	62 1 11
Bone superphosphate, 225lb	32 11 0	16 5	32 6 2
Bone dust, 320lb	25 7 0	13 3	26 11 7
No manure	21 7 0	11 8	24 13 6

Experiments.

ley, which, the rains, and exposed to the burning sun ... erings, but altogether without manure, an outturn of 30 7 bushels to the acre. A neighbouring plot which had been trenched and used as a latrine for 80 days gave the enormous outturn of 47·1 bushels to the acre

As far as these experiments prove anything, they support the view that with the high and careful cultivation under which the best wheats are grown, the average produce is certainly not less than from 20 to 25 bushels ...

to have included manuring with salt- manures fully support the demonstra- tion ... under the accounts of Bombay and Bengal.

CENTRAL PROVINCES.

CENTRAL PROVINCES 729

Re ... 501, 516; Settlement ...

The subject ... of most other pro... reports. The con... Fuller ... 1888 ... will be ...

ly demonstrated. The provinces are ...

CULTIVATION in the Central Provinces.

recorded in our Settlement Reports large tracts of land have been taken up and brought into cultivation. The returns first obtained are well known, and important records have been kept of the deterioration of productiveness. The results have been identical with those obtained in America. The newly reclaimed land gave twenty and thirty fold for a few years, but rapidly deteriorated until it reached a fixed, or relatively fixed, position. The district officers repeat in their annual reports that there are still vast tracts of land on which this process might be repeated. In perhaps no other part of India is the principle of paucity of population, large holdings, and correspondingly low systems of agriculture more forcibly demonstrated. In the North-West Provinces small holdings and careful cultivation have produced results that, even with the present agricultural appliances, compare favourably with Europe. In the Central Provinces, on the other hand, the proprietor of a large estate is satisfied with the comparatively small results obtained by cheap and primitive means."

Soils. 730

SOILS.—"To understand the soils of these provinces, it is necessary to consider the geological formations from which it has been built up. The great basaltic formation which occupies nearly a third of the peninsula, crosses the north-western division of the Central Provinces, and slopes north-west in the drainage areas of the Narbada and Tapti rivers, and south-east in that of the Godaveri. To the south and south-east of this "Deccan trap" there extends the vast region of the archæan rocks of India. These two geological regions are broken here and there by isolated patches of the Gondwana and Vindhyan rocks, and the disintegration of all has contributed to the local peculiarities of the soils. The wheat fields of the northern section, bordering on the Narbada, owe their fertility to the Deccan trap, which is generally considered to have, by disintegration, produced the rich black "cotton soils" of the localities in which the formation occurs. There has been some controversy on this point, certain authorities maintaining that the black soil of the Central Provinces owes its origin to the action of lacustrine deposits. But, without entering into this discussion, it may be stated that there can be little doubt that, in certain cases at least, black soil does consist of disintegrated trap, since the process of disintegration can be traced *in situ*. Mr. Fuller's description of the local modifications of this soil is of interest, and may be quoted in entirety:—

"The black cotton soil is prominently characterised by its stubbornness under opposite extremes of damp and dryness. When soaked with rain, it becomes a sticky unworkable morass; and when dry, rapidly becomes of great hardness, splitting up into numerous dry fissures, which swallow up any water applied to the surface, and enormously increase the cost of irrigation.

"This black or 'cotton' soil is known by various names indicating the proportion in which it is mixed with lighter soil. It is of very variable depth, lying in much thicker deposits in flat valleys than on sloping ground. It is most suitable for wheat when at its greatest thickness, since, from the great capacity which it then enjoys of absorbing rain-water, it can, in a monsoon of average intensity, lay up a store of moisture sufficient to carry a wheat crop through a cold season in which the winter rains hold off entirely. When it is merely a shallow veneer of earth, covering rocks, it dries, of course, with far greater rapidity, and is in this case devoted to the production of rain (or *kharíf*) crops. This difference is brought out into strong relief by a comparison of the agricultural returns for the contiguous districts of Hoshangabad and Nimar. In Hoshangabad deep black soil predominates, and, in consequence, 63 per cent. of its cultivated area is returned as under wheat. The greater portion of the Nimar district is hilly or undulating ground, consisting of trap rock, overlaid with a shallow bed of black soil. Wheat only occupies 4 per cent. of its cultivated area."

CULTIVATION in the Central Provinces.

Area.
731
Conf. with p. 94.

Regarding the distribution of the area through the various districts

The areas in each district during the past year, and the proportion irrigated, may be most conveniently shewn in tabular form :—

District.	Irrigated.	Unirrigated.	Total.
	Acres.	Acres.	Acres.
Saugor	944	568,541	569,485
Damoh	211	183,374	183,585
Jabalpur	...	257,869	257,869
Mandla	...	38,977	38,977
Seoni	...	284,580	284,580
Narsinghpur	1,211	103,896	105,107
Hoshungabad	20	598,601	598,621
Nimar	4,784	35,166	39,950
Betul	35	138,088	138,123
Chhindwara	40	142,131	142,171
Wardha	16	290,984	291,000
Nagpur	10	465,889	465,899
Chanda	246	85,255	85,501
Bhandara	359	139,735	140,094
Balaghat	21	28,040	28,061
Raipur	...	121,123	121,123
Bilaspur	...	81,466	81,466
Sambalpur	...	329	329
GRAND TOTAL	7,897	3,524,044	3,531,941

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in the Central Provinces.

Races. 732

Races.—The commonest kinds of wheat in these provinces are said to be *bansi, houra, daudkhani* or *pilalia,* a hard white wheat; *kathia, ghatka, hausia, bangasia* or *chawalkathi,* a large coarse red grain; *pisi,* the soft white wheat cultivated for export, and *botka,* white and red, a short, heavy, soft grain. The white soft wheats have increased in proportion very greatly during the past fifteen years. Thus Mr. Fuller writes:—

"Natives prefer, for ordinary consumption, the hard glutinous varieties to the soft white varieties, which are principally in demand for the English market. Before the commencement of the annual drain of wheat to Bombay, soft wheat of the kind known as *pissi* was held in very low estimation, and commanded a price which ruled from 8 to 10 per cent. lower than that of the hard *kathia* variety. Now its price is at least 12 per cent. higher than that of *kathia.* In old days it was no uncommon stipulation of a ploughman contracting for service that he should not have to eat *pissi* wheat more than twice a week. Now a ploughman who demanded it twice would certainly not receive it. *Pissi* wheat is grown on lighter land than *kathia,* and it is reported from both Saugor and Narsinghpur that the value of light land has risen in considerably larger proportion than that of heavy land, in consequence of the request in which *pissi* wheat now stands for the Bombay market."

The samples submitted to Dr. Forbes Watson were classified by him as follows:—

Class.	District.		Name.	Weight per bushel.	Price per quarter.	Remarks.
Soft white	Baitul .	...	Pissi . .	63	46 0	Like Californian.
	Hoshungabad .	...	Pissi white .	62	48 0	Like Australian.
	Ditto .	...	Sohareea .	...	48 0	" "
	Mandla .	...	Pissi sookrawali . .	60½	46 6	Like Californian.
	Saugor .	...	Pissi . .	62½	46 0	Long berried.
	Seoni .	...	Mundi . .	64	47 0	Like Californian.
	Ditto .	...	Pissi . .	59½	45 6	
Hard white	Saugor .	164	Hansia .	62½	40 6	Long berried.
Soft red .	Nimar .	194	Dhunya .	...	40 6	Fine specimen.
	Bilaspur .	567	Khathia .	60	41 6	Small berried.
		566	Red pissi .	63	41 0	

Method. 733

Method of Cultivation.—The system of cultivation which we have already described as practised in the heavy black soils of Bombay is practically that pursued in these provinces. It differs materially from the system followed in the North-West Provinces and the Panjáb, but it is probable that, while improvement is possible, the method followed in the latter localities could never be adopted in a country the natural conditions of which are so different. The system adopted has been fully described by the Director of Land Records and Agriculture, from whom we may again quote.

"Although these provinces are entitled to rank with the North-West Provinces or the Panjáb in respect to their wheat production, yet the conditions under which wheat is grown here are widely different to those of the two latter tracts. Manure and irrigation—all-important in Upper India—play but an insignificant part here. The thinness of population

CULTIVATION in the Central Provinces.

and consequent large extent of individual holdings, offers more inducement to low farming on a large, than to high farming on a small, scale The outturn of the land is actually far smaller than in more crowded tracts, whilst the surplus produce per head is considerably larger, since

Method

reported to be almost unworkable in the rainy months, while shallow soils, with a substratum of rock, dry too quickly to be suitable for *rabi* crops. For ordinary wheat cultivation, operations commence in April or May, when the surface of the ground is scarified with a hoe-plough known as the *bakkar*. After the setting-in of the monsoon the surface is again

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is given at the beginning of October, after which the field is ready for sowing. This represents the preparation which a careful cultivator will give his land under favourable circumstances, and, as a rule, land seldom receives more than two or three hoeings before it is sown. The seed is occasionally sown broadcast and ploughed in, but is more generally

store of moisture which capillary attraction is to keep within the reach of the wheat crops during the dry cold-weather months. The process, therefore, corresponds, in some sort, to irrigation. It is reported to increase the outturn of wheat by at least 25 per cent, and to be of much service in clearing land infested with *kans* grass and other weeds. The principal reason why it has not spread over a wider area lies probably in the neces-

CULTIVATION in the Central Provinces.

and the pressure of the water on the confining banks—causes which have hitherto ruined experiments tried with isolated fields.

Manuring. 734 MANURING.—"In regard to the use of manure, there appears considerable diversity of practice in different parts of the provinces. Thus, manure is reported to be hardly ever applied to land in the Nerbudda valley, while in Nimar and in the districts of the Nagpur Division its utility is fully recognised, each wheat-field receiving a manuring, fi possible, once in three years. The explanation may lie in the greater effectiveness of manure on shallow than on deep soils. On the former it makes all the difference between a fair crop and no crop at all, while on the latter it would merely add in some degree to a fertility which is as yet very far from being exhausted."

Irrigation. 735 IRRIGATION.—"Irrigation is almost entirely confined to sugar-cane and garden crops, and is therefore rarely, if ever, applied to wheat, since if the rainfall is at all propitious, the harvest yields a sufficiently large surplus to satisfy the cultivator. The most favourable distribution of rainfall possible would be a heavy fall of 8 or 10 inches between the middle of June and the third week in July: then a break of a fortnight to allow of ploughing, followed by a second fall of 5 to 6 inches in August. September should open with a week or ten days of fair weather followed by a heavy downpour bursting on into the beginning of October. Under these circumstances, a fair crop would be reaped in the absence of all rain between sowing and harvest time, but there should be a fall of 2 or 3 inches during the cold weather, which would greatly add to the outturn if protracted damp weather does not develop the fungoid diseases of rust or smut. It is impossible, however, to say whether, with a greater press of population, irrigation may not be gradually extended to wheat. Experiments on the Nagpur Model Farm have shown conclusively that two waterings add very greatly to the outturn, but it is very doubtful whether the crops can ever stand the cost of irrigation if wells are the only source available."

In regard to the much-vexed question of the exhaustion of the soil by continuous cropping, it will be impossible to do better than cite the conclusions to which Messrs. C. A. Elliott and C. Grant arrived, after careful enquiry, when settling respectively the Hoshangabad and Narsinghpur districts. There appears to be no room for doubt that the black soil of the Nerbudda valley yielded a far larger return when first broken up than it does now. Tradition points to a rate of produce in the golden age—at the commencement of this century—which seems to have been as much as ten- or twelve- fold the seed sown; that is to say, 15 to 18 maunds to the acre. This is corroborated by recent experience of newly-broken land in the Tapti valley, an almost precisely similar tract, of which Mr. Elliott wrote that "the wheat stands breast-high in some of the new villages, and the ear is very large and full; the crop is nearly double the average of the Nerbudda valley." He estimated the average outturn in those villages at 12 maunds (=16 bushels) to the acre. The outturn appears to have fallen off very rapidly at first, the deterioration, indeed, was very apparent as early as 1844, and receives considerable attention in Colonel Sleeman's writings. It was in full progress during his time, but the decline seems now to have reached a point below which it does not continue. Mr. Elliott's enquiries led him to believe that the outturn fell very rapidly from 12 maunds to 8, and then rather slowly to 6 or 7. Mr. Grant expresses a similar opinion in the following paragraph:—

"Mr. Maloney and Captain Sleeman, who are the only authorities regarding the early condition of the valley, naturally attached great importance to the deterioration of the soil, for it was going on, and that rapidly, before their very eyes. All subsequent writers on the affairs of the district

CULTIVATION in the Central Provinces.

Irrigation.

seem to have followed blindly in their footsteps, and it is almost a *reductio ad absurdum* of an undoubtedly true theory to find one of the district o... in or about 1830, that the returns had then sunk in places t... was hanging over the cultivating classes T... of fertility in t...

...tion is so minute as to be ... poses, it may be assumed that the rates of produce ... at the present point, even if improved modes of cultivation are not introduced in the course of the present settlement."

Yield. 736

QUANTITY OF SEED, AND YIELD.—The quantity of seed sown per acre appears to vary within wide limits, but *from about 80 to 120lb* may be taken as the averag... called for from all the districts in 1878 showed this differen... ranging from 50lb to 150lb. ... tained at the Mode... fields an...

The ... to a certain extent, ... the par... soil. T... a wond... certain ... the aver... and the yie... many of the... Dr. Watt,

"The quest... to a Prov... distr... The ... crop of his di... been, a large... and this, too... been, for ma... ally large amount. ... ties, and instructions were, accordingly, issued ... be held under the supervision of responsible European officers. Certain fields that had been cultivated by the owners were harvested in the presence of the officer appointed t... ...ment in each district. A large number of these trial h... that the normal yield per acre ... of accuracy. This has shown a considerable ... crop experimented with.

"In the Raipur district th... harvests gave a mean of 1,048lb; of seventeen harvests ... Nar-singhpur, 640lb. The lowest ... mean of four harvests was 382lb. Without ... detail, it may be added that the opinions held, both by Government ... the public, as to the low yield in the Central Provinces, have been shown to have been founded on prejudiced returns. We have, in connection with

TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in the Central Provinces.

Yield.

the Panjáb, referred to the difficulty experienced in getting the Natives to furnish accurate information as to their profits. It may fully be anticipated that like results to the above will follow in Upper India when the Government feels called upon to direct test harvests to be made in the Panjáb as have now taken place in the Central Provinces. Reverting to the yield in the Central Provinces, it may, in conclusion, be said that in Raipur the yield in the older reports is put down at 368lb (instead of what it has now been found to be, 1,048lb), and in Narsinghpur at 200lb (instead of 647lb). These are test examples, and it may be inferred that, in the poor districts, the early records were found to be relatively more nearly correct than in the rich. Thus, for example, in Hoshangabad, instead of 382lb, the return was fixed at 328lb.

"The rents paid for wheat lands in these provinces vary considerably, according to the nature of the soil and the facilities of export. The average in Hoshangabad is 1*r.* 9*a.* 3*p.*, in Saugor 1*r.* 14*a.*, in Bilaspur 14*a.*, in Jabulpur 2*r.* 4*a.*"

The average yearly outturn during the four years ending 1887-88 is estimated, in the returns of the Agricultural Department, to have been 919,000 tons on an average acreage of 4,125,000 acres. These figures give an average acre yield all over, for these four years, of 6·2 maunds or 496lb to the acre, an average very much lower than that derived from the experimental harvests above alluded to. The outturn for 1888-89 is reported to have been very much below even this small average, being estimated at 705,000 tons on a forecast area of 3,866,262 acres (about 330,000 acres in excess of the actual area). These figures give an average acre yield for the year of only 5·1 maunds, or 408lb to the acre.

Mr. Fuller sums up his consideration of the question as follows:—"It is probable that the outturn at present gathered from land which has long been under cultivation may be considered as stationary for a very long period of years. The available food-substances which were found stored in the soil when it was first broken up have now been exhausted, and the crop depends for its support on the stock of nutriment which the soil acquires each year by absorption from the atmosphere, as well as by the regular process of disintegration which is at work within itself. Experience has yielded exactly similar results in America, where the produce of freshly-broken land has been found to decrease very rapidly during the first few years of cultivation, and then retrogress with shorter and shorter steps until a point is reached at which it becomes fixed, or below which the decrease is so small as to be almost imperceptible. And a further corroboration, if one be needed, is furnished by the results of certain experiments conducted by Messrs. Lewes and Gilbert at Rothemsted which point to an exactly similar conclusion."

BERAR. 737

BERAR.

References.—*Wheat Production & Trade, 1878, 1883, 1886; Forbes Watson, Report on Indian Wheat. 1879; Crop Reports & Forecasts; Agri. Statistics, Br. Ind.*

Soils. 738

Soils.—The richest wheat soil in this province, as in the Central Provinces, is the black cotton land. The crop is cultivated to a large extent in this class of soil in the Purna valley, also on the loam found above the Southern Gháts. It is never grown on the lighter soils, which are suited only for *kharif* millet crops, etc. Irrigation is rarely employed. Wheat lands are manured in their turn with other fields according to the means of the cultivator, who generally understands and fully appreciates its value. The only kinds available are, as a rule, farm-yard manure and the ashes of *jowari* roots.

Area. 739

Area.—The total area under wheat in Berar has undergone a very large expansion during the past fifteen years. This increase during the five years ending 1887-88 over a similar period ending 1882-83 amounted to the large proportion of 32 per cent., and was accompanied by a diminution in other crops of 5·7 per cent In 1888-89 the area amounted to 942,029 acres, a considerable increase over the average for the preceding five years. Mr. Hobson, Settlement Officer, states that with the exception of the Buldana and Ellichpur districts, the area under *jowari* and cotton has decreased and been replaced by wheat and linseed.

Conf with p. 94.

The distribution of the area during 1888-89 is shown in the table below:—

District	Irrigated.	Unirrigated	Total
Amraoti	1	193,120	193,121
Akola	476	126,773	127,249
Ellichpur	12	70,505	70,517
Melghat		11,269	11,269
Buldana	6,208	241 929	248,137
Wun		89,738	89,738
Bassim	1	201,997	201,998
TOTAL	6,698	935,331	942,029

Races. 740

Races.—Here, as in the Central Provinces, the hard red race was at one time the most extensively cultivated, and perhaps is still so It is, however, certain that the recent great expansion of area has arisen to meet the demands of foreign trade, and it is therefore probable that the soft and hard whi[illegible]ltivated much more extensively than formerly, to meet the [illegible]l South European markets. The cultivatc[illegible]nd it has been on [illegible]ke to a new rac[illegible] reported

The samples submitted [illegible] on as follows:—

Class.	District.	Name.	Weight per bushel.	Price per quarter.	Remarks.
Hard white	Nagpore	Botka	61	40 6	Long, thin
	Amraoti	Bansi	61	41 6	Long berried
	Ellichpur	Ditto	60½	41 0	Ditto.
	Ditto	Ditto	60	40 6	Ditto
	Akola	Ditto	61	41 6	Long berried.
	Ditto	Ditto	60	41 0	Ditto.
	Buldana	Ditto	61	41 0	
	Ditto	Ditto	60	41 0	
	Ditto	Ditto	61	40 6	
Soft red	Bassim	Casdee	61	41 0	

Method. 741

Method.—There is little difference between the method of cultivation pursued in the Berars to that already described under the Central Provinces. The following remarks by Mr. Dunlop (*Wheat Prod. & Trade, 1883, 94-99*) are, however, of interest:—

Sowing Seasons. 742

Sowing.—"Wheat is sown in October and reaped in February, and is cultivated in rotation with other crops. It is never sown in two consecutive

CULTIVATION in Berar.

Rotation. 743 years on the same land. The system of rotation varies according to circumstances, or the ideas of particular cultivators. A not uncommon rotation has hitherto been, *1st*, wheat, *2nd*, lac (Lathyrus sativus), *3rd*, cotton, *4th*, jowari, *5th*, wheat. In other cases wheat is cultivated every second year, the intermediate crop being cotton or *jowari;* and if the demand from Europe continues, this practice is likely to become more common, to the exclusion of gram and other pulses, for which there is only a local demand.

Ploughing. 744 PLOUGHING.—"Preparatory to sowing wheat, the land is carefully prepared with the native plough (*bukhar*), and manured, if possible. Beyond this no special attention is given to the crop. A careful cultivator will pass the *bukhar* (light plough) two or three times over his wheat land in the month of May, although the crop is not to be sown till October, the object being to soften the surface of the soil, so that it may absorb more of the rainfall. Being sown after the monsoon, weeding is unnecessary, and the cultivation is consequently less costly than that of cotton or other autumn crops.

Seed. 745 "I have come across cases in which the cultivators procured their seed from villages reputed to excel in the production of wheat, but the system of selecting seed does not generally prevail."

Outturn. 746 OUTTURN.—The average acre yield for the province has been estimated by the Agricultural Department, from actual measurements of selected fields during five years, ending 1887-88, to be $4\frac{1}{2}$ maunds, a very low figure when compared with those of most other provinces. This outturn if applied to the acreage under wheat for the past year, 1888-89, yields an estimated gross outturn from the province of 42,39,130 maunds, or 151,400 tons, an increase of about 83,000 maunds or 2 per cent. on the average for the preceding five years, though a considerable decrease on that for 1887-88.

MADRAS.

MADRAS. 747 **References.**—*District Manuals:—North Arcot, 416; Coimbatore, 211, 321, 583, 585, 586; Cuddapah, 43; Kurnool, 172; Nilágiri, 134, 463, 466, 467, 469, 475; Salem, I., 148; II, 61, 67, 105, 225; Trichinopoly, 366; Settlement Reports:—Chingleput, 10; Kistna, 15; Kurnool, 18; App. O. paras. 127, 207; Nilágiri, 7; Salem, 13; Madras Manual of Administration:—I., 101, 288, 290, 296, 326; II., 60, 78, 83, 88, 109, 110, 545; Report Rev. & Agri. Dept., March, 1886; Govt. of Ind., Wheat Prod. & Trade in Ind., 1878, 1883, 1886; Forbes Watson, Report on Ind. Wheat, 1879; Agri. Statistics Br. Ind; Crop. Reports & Forecasts.*

Wheat is a very unimportant crop in this Presidency, an average of 27,000 acres only being under the crop. The largest wheat-growing districts are Kurnool, Kistna, Bellary, Coimbatore, and Anantapur, but a small crop is cultivated in most of the others. There would appear to be but little chance of the area undergoing any material expansion, since the soil and climate of the Presidency are not generally favourable to wheat. Thus Mr. Glenny, then Acting Director of Settlement and Agriculture in the Presidency, wrote in 1886:—

"So far as my observation goes, Karnool, is, as one would, from the geological conditions, expect, the district most likely to come to the front in wheat-growing. I took special pains to ascertain whether there were any substantial grounds for expecting the Karnool *rayats* to set about raising wheat for export. The merits of the question appeared to be fully understood both by the large farmers and by traders; and there appeared to be a consensus of opinion, which I am afraid is but too well founded, that of all the more valuable crops grown on unirrigated land, wheat is by far the most delicate. It suffers, and suffers permanently, from spells of bad weather that hardly affect the millets, etc. It can be success-

CULTIVATION in Madras.

fully raised on no land but the best *regada* overlying limestone, and this kind of land is so valuable for *cholum* and cotton that none but a very well-to-do man, of more than usually speculative turn, cares to devote more than a small patch of it to wheat."

Races. 748

RACES.—The wheats grown in Madras are of very poor quality, so much so that they have been stated to rarely meet a sale for making flour, the bakers being compelled to obtain the wheat required in their trade from other parts of India (*Wheat Prod. & Trade, 1883, 34*). A very large proportion of the wheat crop appears to consist of "spelt," since in the returns of outturn from the various districts the expression ... uently met

Yield. 749

... report to ... and need ... the Agricultural Department is 6,800 tons, or 1,90,000 maunds, a figure which gives the average acreage yield to be a little over 7 maunds an acre. There is said to be ample evidence to shew that the yield has fallen off to a considerable extent in the Kaity valley and other wheat-producing districts of the Nilghiris.

BENGAL.

BENGAL. 750

Area. 751 Conf. with p. 94.

ors on the best data they can obtain.

be—

District.	Area.	District.	Area.
Patna Division.	Acres.	*Burdwan Division.*	Acres.
Patna	200,000	Burdwan	1,340
Gya	82,300	Bankoora	2,000
Shahabad	200,000	Beerbhoom	710
Durbhanga	12,200	Midnapore	600
Sarun	95,000	Hooghly	59
Champarun	89,000	*Chutia Nagpur.*	
Bhagulpore Division.		Hazaribagh	1,500
Monghyr	107,200	*Orissa Division.*	
Bhagulpore	162,000	Cuttack	500
Purneah	27,600	Balasore	600
Maldah	3,300		
Sonthal Pergunnahs	8,500		
TOTAL		TOTAL	989,409

CULTIVATION in Bengal.

Races.

752

Races.—"Bengal, like other provinces, grows a variety of wheat-grains which cannot be reduced to a uniform or scientific classification. The four principal kinds exported from Calcutta are—

No. 1 club, containing 75 per cent. of white and 25 of red.
No. 2 club, containing 65 per cent. of white and 35 of red.
No. 3 hard red.
No. 4 soft red.

"Buxar sends No. 1 club—a very superior soft white grain. It is extensively grown in the southern part of that sub-division and in Sasseram, and is equal in quality to the best Delhi or Mozufferpore wheat. Bhagulpore grows hard and soft red, while Bengal principally sends soft red only—a grain of very inferior quality.

"A sample of Buxar wheat grown in the sub-division of that name and picked up in a local bazár, was sent to the Chamber of Commerce, and appraised by the Committee of the Calcutta Wheat and Trade Association. It was declared to be superior in quality to the ordinary No. 1 club of trade, as the sample contained no red grain, while the ordinary No. 1 club contains a mixture of 20 to 25 per cent. of red. It thus appears that there is grown within these provinces a species of wheat equal or superior to that of any other part of India, and, therefore, that there is no need to travel outside for the purpose of procuring superior seed. In ignorance of this fact attempts have, from time to time, been made to introduce seed-grain from Cawnpore, Delhi, and Mozuffernagar, even the Chamber of Commerce being itself, I believe, unaware that Buxar No. 1 club is largely produced in the Buxar and Sasseram sub-divisions and in other parts of Behar. There is reason to believe that the cultivation of this species might be profitably extended in the South Gangetic districts of Behar, should the Chamber of Commerce see its way to effecting an alteration in the present system of refraction, thus causing superior white grain free from dirt to command an adequate price. Samples of the red wheat produced in Bhagulpore were also appraised by the Committee of the Calcutta Wheat and Trade Association, and it was found that this grain was four annas per maund inferior in value to the Buxar grain. Since the imposition of a duty on wheat in France, the demand for this species has very much fallen off. Attempts have, accordingly, been made by Mr. Hossein, the Agricultural Officer at Bhagulpore, to introduce Buxar wheat in that division with very satisfactory results. Though the quality of Cawnpore wheat, which was supplied by the Chamber of Commerce for experimental cultivation in Bhagulpore, slightly deteriorated, yet it was found that Buxar seed, which was also tried in the same district, yielded a grain declared by the Committee to be 'a splendid description of wheat, soft, mellow, bold, regular, and of good colour.' Its value is two annas per maund over that of ordinary Buxar quality, which itself is four annas per maund superior in value to the grain now grown in Bhagulpore. Mr. Hossein has been instructed to endeavour to extend the cultivation of this grain in Bhagulpore. The soil and climate of the Shahabad, Patna, Bhagulpore, and Monghyr districts seem to be well suited to the growth of wheat, while these districts enjoy considerable advantages in point of cost of carriage of the grain to Calcutta amounting to four to five annas per maund, over cultivators of the districts of the North-Western Provinces."

It will be seen from the above remarks by Mr. Finucane (*Report, 1886*) that though an inferior soft red wheat is the general crop of Bengal, a very superior white soft wheat does occur in the province, and that its cultivation might be considerably extended. The samples enumerated

below were selected by Mr. Forbes Watson as the finest submitted to him from Bengal in 1878:—

CULTIVATION in Bengal.

Races.

Class.	District.	Name.	Weight per bushel.	Price per quarter.	REMARKS.
				s. d	
Soft white	Chumparan	Dawoodia	63	47 0	Small berried.
	Gya	Ditto	62½	48 0	Like Californian
	Patna	Maghie	64½	45 6	
	Shahabad	Doodhia	62	47 0	Like Californian.
Hard white	Moorshedabad	*Jamali*	62½	41 6	*Short berried.*
	Monghyr	Bogra	62	41 0	Long berried, flinty.
	Maldah	Gangajali	63½	42 0	Very fine, long berried
	Tirhoot	*Jamalkhani*	64	41 6	*Small berried.*
Soft red	Beerbhoom	Jamali	61½	41 0	
	Burdwan	Desi	61	41 0	Small berried.
	Bhagulpore	Jamali	62½	41 0	Ditto
	Hazareebagh	Gour	63	41 6	Small berried, yellowish.
	Lohardugga	*Jogra*	63½	42 0	*Stout.*
	Gya	Lall	64	41 6	Stout, short berried.
	Tirhoot	Sarhal	62	40 6	Fine, clean, semi-hard.

Method.
753

June and first half of July) and is reploughed eight times before *Asin* (second half of September and first half of October), 'when it is harrowed and the seed is then sown. In fields where two or more different kinds of seed are to be sown, all the seeds are mixed and sown at the same time.'

Mr. Peppe of the Opium Department, who has made the wheat trade a subject of special enquiry, makes the following observations on this

CULTIVATION in Bengal.

Method.

ance is the black clay soil extending from the eastern part of the Sasseram sub-division well into the Bhaboosh sub-division, and extending from the Grand Trunk Road on the one side, and on the other to within 15 miles of the Ganges, say 25 miles by 20 miles = 500 square miles.

"In this tract some of the finest wheat is grown, about 50 per cent. of the whole outturn of the district; the cultivators attempt to keep their seed pure white, but there is a tendency to revert to the red variety: the cultivators tell me that there is no market for red wheat, and that they endeavour to produce a pure white soft wheat without admixture of any kind, and sow it entirely by itself. Only a little linseed is sown round the margin of the field, and the whole *rabi* cultivation in some villages in this tract is confined to wheat and linseed, with small patches of barley and other crops for home consumption. The wheat from this tract, although very good, is not equal to the wheat grown on the alluvium lands, and sells for one to two seers less in the rupee. The third principal cultivation of wheat is the *koeries* and others, amounting to about 5 per cent., who sow on *dih* lands (lands adjoining the village site), all over the district, one *bigha* or so at a time on rich *dih* land well manured and irrigated. This is probably as fine grain as could be produced in this district, and the only improvement that could be effected would be by sowing a better class of seed, which the *koeries* and others would be very glad to do; as it is, they carefully select their seed and endeavour to get rid of all bad grains before sowing. There is a fourth source of wheat, *viz.*, the small patches of wheat sown in good soil at the foot of the hills or in the valleys or local alluvium along the banks of the smaller streams; this does not amount to more than 5 per cent. of the wheat grown in the district, and is very variable in quality, a large proportion being red wheat in the south of the district. With regard to the question of increasing the cultivation, the whole of the *dearu* lands could be sown year after year with wheat without any loss in quality, for the land is annually renewed by a rich deposit, and therefore the produce of this tract could be enormously increased, and no doubt the time will come when the value of a well-bred wheat crop, free from earthy particles or any other kind of grain, will be as well known to the wealtny cultivator of the *dearu* as to the British farmer.'

"Mr. Allen correctly remarks that the conditions of soil and climate most favourable for the production of the best wheat cannot be determined off-hand. Experiments are being made under the supervision of agricultural officers at Dumraon and Arrah in Shahabad, Sripore in Sarun, in Wards' estates in Patna, in Bhagulpore, Monghyr, and elsewhere, in order to determine what species is best suited to the soil of these districts, what is the best method of cultivation, and by the application of what manures the largest outturn may be secured with the greatest economy. It will take some years before any of these questions can be positively answered. So far as our present knowledge extends, the soil and climate of Shahabad appear to be most favourable to the growth of the best grain, while Bhagulpore has the largest area under cultivation, but its grain is inferior in quality. Whether this inferiority is due to climatic and soil conditions it is not possible with our present limited knowledge to say for certain. Further experiment and observation will be made on this point. While the facts that red grain is so extensively grown, and that the white soft grain of Cawnpore has slightly deteriorated in Bhagulpore even in one year, appear *à priori* to indicate that the preference shown for red wheat by the cultivators of that division is not due to accident or ignorance, yet on the other hand the success which has attended the experimental cultivation of Buxar seed in Bhagulpore

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and the results of the experiments made in the Patna Division afford good grounds for the hope that much may be done in both the Patna and Bhagulpore Divisions towards increasing the yield, and in the former division especially, towards improving the quality of the grain"

The method of cultivation followed appears to be a fairly careful one. The following description by Mr. Basu of the system pursued in Lohardaga may perhaps be taken as typical:—

Soil. 754

SOIL.—"Wheat is found to do best on *kewál* or strong clayey soils, and sufficiently well on loams and alluvial deposits. On lighter soils the ear becomes weakly and shrivelled and the grains do not develop.

Rotation. 755

ROTATION.—"The crop is, as a rule, grown on *bheetá* lands, and occasionally on *bári* lands which support a clayey soil On *bheetá* it may be grown on the same land for two or three successive seasons, after which it is found advisable to crop it with some leguminous crop for a year or two. On *bári* land it usually follows maize or *máruá* in the same year. It is either grown as a single crop, or as a mixed crop with gram or lentils. The practice of sowing mixtures is not, however, so general as in Behar Occasionally a wheat-field is fringed on the sides with linseed

Ploughing. 756

PLOUGHING, SOWING, ETC.—"The land is opened by two ploughings in *Ássár*, if the *rayát* can spare any time for the work [illegible] of weeds and exposed to rain and [illegible] time too busy with paddy [illegible] on their wheat-fields, which [illegible] rainy season. If the land h[illegible]ius kept free the first ploughings are [illegible]s are at this case they are given in [illegible] been broken up [illegible] and labour reduced to a sufficiently fine tilth to receive the seed. When the soil has become sufficiently dry on exposure, the plough is closely followed by the *hengá* or harrow. The total number of ploughings varies usually from 8 to 10. When the soil has been well pulverised and levelled by the last harrowing, the seed is drilled in furrows by the *táriá* or drilling plough. The *táriá* goes round and round the field in gradually narrowing circles, and finishes at the centre. A plough breadth of land is allowed between two contiguous lines of seed. The quantity of seed-wheat sown per *bigha* is a little variable, rich soil requiring less seed than comparatively poor ones. On the average, 36 seers of grain may suffice for sowing one acre of land. The season for sowing wheat extends over the whole of the month of *Kártic*, and the early part of *Aughrán*. *Doáb* lands or those forming the beds of *áhrás* take longer time in drying and are the latest to be sown.

Seed per acre. 757

"After the seed has been drilled in, the crop requires no further treatment before it is harvested. Wheat-fields are neither manured nor weeded. Irrigation of wheat is also all but unknown in Palámau, and it is only here and there that a *few rayats* are fortunate enough to be able to command the use of a village well for this purpose. The people know fully well that by means of suitable manuring and irrigation, the outturn of wheat may be easily doubled, and the precarious nature of this as well as other *rabi* crops, depending as they do entirely on the chances of rainfall, safely guarded against. But unfortunately both these measures are, under their present circumstances, quite beyond their means.

Irrigation. 758

Harvesting. 759

HARVESTING.—"The wheat harvest commences in the latter part of *Fálgun* and extends over the whole of *Cheyt*, and in rare cases to the early days of *Bysák*. The crop is cut when perfectly ripe and the straw has become quite dry and crisp The crop is reaped by the sickle at about 6 inches above the ground. It is made up into loads which are carried on the same day to the threshing floor. It is spread out on the floor for a day or two to get fully dried up, when it is threshed in the

CULTIVATION in Bengal.

same way as paddy. The bullocks, usually 14 in number, and tied breast to breast to two rows, are made to tread the mass for two or more days in succession until the straw which has become crisp and friable by thorough exposure and dryage is reduced into small bits, rather soft to the touch, not unlike the condition of chopped straw. The straw thus reduced is known as *bhusá* and is deemed an excellent food for cattle.

"The grain is subsequently winnowed with the basket in the same way as paddy.

Storing. 760 STORING.—"There are four different ways of storing wheat, and in fact, all other valuable grains. These are—

"(1) In *morás* (or spherical baskets made of loose straw, bound round with straw, and *chop* or bark ropes), as in Chutiá Nágpur Proper. Storing grain in the *morá* is considered the best safeguard against weevils.

"(2) In *delís* or bamboo baskets. Although the top and the inside of the basket is plastered over with a mixture of cowdung and mud, grains are found to be liable to ravage by weevils and white-ants.

"(3) In pits or *kothis*, as is the common practice all over Behar and the North-Western Provinces."

Yield. 761 YIELD AND COST OF CULTIVATION.—The outturn estimated by the Agricultural Department on an average area of 1,179,500 acres for the five years ending 1888-89, is 346,000 tons, or 96,88,000 maunds. This amounts to an average acreage yield of a little over 8 maunds. This figure is slightly below the amount estimated by Mr. Basu, who writes:—"The yield of wheat averages, in Palámau, about 10 *kachhá* maunds per local *bigha*, or about 9 maunds per acre, valued in ordinary times at R2 to R2-4 per maund. On good clay soils the cultivation of wheat is found to be very remunerative, as the following calculations of its cost and outturn will clearly show. For the purposes of these calculations, the local standards of land and grain measure have been taken for the sake of convenience; and the wages of a labourer reckoned at the rate of 6 pice per diem, and the hire of a pair of oxen at the same rate as the wages of one labourer.

"*Cost of Cultivation of Wheat per local bigha.*

Cost. 762

	R	*a.*	*p.*
"Eight ploughings with harrowings (three ploughs can plough one local *bigha* in 1 day: 24 ploughs =24 men and 24 pairs of bullocks, at 6 pice each)	4	8	0
"Seed-grain one local maund=27 seers (*pakka*) at R1-8	1	8	0
"Reaping corn and carrying it to threshing floor (10 men at 6 pice each)	0	15	0
"Threshing and cleaning grain (four men and seven pairs of oxen for two days=11 men for two days at 6 pice per diem)	1	0	6
"Rent of 1 *bigha*	2	0	0
TOTAL COST	9	15	6
Produce 10 maunds (local) at R1-8	15	0	0

The above figures reduced to standard measures show:—

Cost of cultivation per acre	13	4	8
Produce 9 maunds per acre at R2-3-6 per maund	20	0	0

"On the *batwárá* system of dividing the produce between landlord and *rayat*, the outlay of the latter would be R9-15-6 *minus* the cost of reaping (15 annas), threshing (R1-0-6) and rent (R2), that is, equal to R6. His income of grain would be R7-8 *minus* $\frac{1}{12}$th of it, being the *patwári's* share, that is R6-14."

CULTIVATION in Bengal.

Crop Experiments. 763

Crop Experiments.—Numerous careful experiments have been performed of late years with a view to exactly ascertaining the outturn, and estimating the effect of manure on yield and quality. The results of experiments made by Mr. Allen on the experimental farm of the Maharajah of Dumraon in the Patna Division are of special interest, and are described by that officer thus:—"The grain from each of the fourteen plots was weighed in my presence, so the results given below may be considered as absolutely correct.

The first table shows the numbers and treatment of each plot:—

Number.	Kind of wheat.	Treatment.	Remarks
5A	Local	Deep ploughed	} With this wheat was sown a small amount of gram.
5B	Do	Shallow "	
10A	Dumraon prize	Irrigated it from well	The well was old and the water probably rich in nitrates
10B	Ditto	Ditto from canal	
11A	Mozaffernagur	Green soiled with hemp	
11B	Ditto	Unmanured	Worst soil on the farm } These two plots were half a bigha each.
12A	Ditto	Manured with ashes	
12B	Ditto	Ditto ashes and saltpetre	
12C	Local	Ditto cowdung	
12D	Do	Unmanured	
12E	Buxar	Manured with saltpetre	Good white wheat
12F	Ditto	Unmanured	Ditto
13A	Mozaffernagar	Ditto	
13B	Local	Ditto	Good red wheat

The plots were arranged so as to make the comparison as fair as possible. Careful accounts were kept of the expenditure on each plot. Each plot (except 11A and 11B) measured exactly 1,600 square yards, or a standard *bigha*. The following table gives the results of each plot:—

1	2	3
Number of plot.	Grain per acre.	Straw per acre.
	Mds. s. c.	Mds. s. c.
5A	16 7 0	25 29 0
5B	13 31 0	22 8 0
10A	14 3 0	16 38 0
10B	8 38 0	11 13 0
11A	27 6 0	36 38 0
11B	15 22 0	22 2 0
12A	20 4 0	22 8 0
12B	23 11 0	25 15 0
12C	18 19 0	22 17 0
12D	13 28 0	16 35 9
12E	27 10 0	62 31 0
12F	14 5 0	17 12 0
13A	15 13 0	12 33 0
13B	12 27 0	18 4 0

The outturn in straw can only be taken as approximately correct owing to the native method of winnowing; but every care was taken

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TRITICUM sativum.

Cultivation of Wheat

CULTIVATION in Bengal.

Crop Experiments.

to have the weight of straw ascertained with as much accuracy as possible. The following points are noteworthy:—

Plots 5A and 5B show the advantage of deep ploughing. Besides the wheat, the former plot gave 39 and the latter 25 maunds of gram. Plots 10A and 10B apparently show that well-water is far superior to canal; but the result of this experiment is misleading. In the first place the well-water was unusually good, as it was full of organic matter, *e.g.*, old leaves, etc., and then the soil on 10B plot is about the worst on the farm. It would be fairer to compare 10A with 12D, the plot sown with good white local wheat which was also canal-irrigated. Here the advantage due to the well is reduced to 15 seers of grain per acre, while the outturn of straw is practically the same in both cases. The outturn from 11A is remarkably good, nearly equalling that from 12E, the best plot on the farm. The hemp was well ploughed in, and must have decomposed thoroughly in order to give so large a yield. The advantage of green soiling in this case amounts to nearly 12 maunds of grain and over 14 maunds of straw to the acre, which of course more than covers in the first year the cost of the treatment whose benefits will continue for at least three or four more croppings.

"Of the remaining plots the following points may be noted:—There are four unmanured plots, *viz.*, 12D, 12F, 13A, and 13B. These four plots were sown respectively with local white, Buxar, Mozaffernagar, and local red wheat. Taking grain alone, the crops come in the following order:—(1) Mozaffernagar, (2) Buxar, (3) white, (4) red; but if we consider the straw only, the order is (1) red, (2) Buxar, (3) white, and (4) Mozaffernagar. The average outturn in grain from the unmanured plots may be taken as approximately equal to about 14 maunds to the acre. At Arrah the average was about 10½ maunds, but the land here is in a good season more suited for wheat than the lighter soil of the Arrah plots. Taking 14 maunds as the average, and disregarding for the present the difference due to the kind of grain used, we may note that the advantage per acre due to the use of ashes alone comes to 6 maunds, to the use of ashes and saltpetre 9 maunds, to cowdung only 4 maunds, and to saltpetre alone over 13 maunds. In fact the outturn here is nearly doubled. I consider the yield from ashes and saltpetre on 12B, which should have given the best result, as abnormally low. *On the other hand, the outturn from 12E is simply astounding; 27¼ maunds of grain, which I found equal to 34¼ bushels to the acre, would be considered a very good crop on good soil in a good year in England, but here in India it is, I believe, unprecedented.* The outturn of straw, over 60 maunds to the acre, or say 2¼ tons, is also very high, for it more than doubles the weight of grain, which is not usual with a good crop. As I saw and examined the grain weighed, there can be no doubt of the accuracy of the figures given above.

I also took the weight of the different kinds of grains per bushel, which reached in some cases over 66lb. In appearance the Mozaffernagar grain looked best, and I have carefully set apart the grain from the beardless ears in the hope of growing in time a beardless variety of wheat."

Saltpetre as manure.

764 Mr. Finucane commenting on this passage writes:—"Mr. Hossein also made similar experiments with saltpetre as a manure in Bhagulpore, the results of which were not so satisfactory. They, however, also show that saltpetre applied at the rate of one and a half to two maunds per acre will give an increase of yield which more than pays the cost of the manure. Applied in excess of that quantity, saltpetre as a manure did not pay. Mr. Allen applied crude saltpetre at the rate of 1½ maunds per acre, mixed with an equal weight of dry earth. The price of the crude saltpetre in the Patna bazár was R3 per maund, or R4-8 per acre. The increas-

in Hyderabad, Mysore, Kashmir (J Murray) TRITICUM sativum.

effect will not be apparent for many years, and may be counteracted by
green soiling or
of saltpetre as
by irrigation.
soiling with hemp.

"As to the effect of different soils in changing the colour of the grain, there appears to be no doubt that wheat brought from a distance will, under the influence of soil and climate, gradually change its character. The Committee of the Wheat and Trade Association report that the white Cawnpore wheat supplied to the Committee and introduced by Mr. Hossein into the Bhagulpore Division deteriorated in colour, and this

... throve better than the white, and thus produced a larger proportion of seed. This process probably went on for a few years, when the major part of the crop became red, and the belief thus arose that the soil caused the white wheat to change to red. Mr Macpherson, in reporting on the point, after enquiry in Nasrigunge, expresses the opinion that the degeneration of white wheat into red on certain soils is so universal that Dr. King's explanation will not suffice. Whatever
f the fact that the white
generates when grown
will be made in order
occurs, and how far it
... of fresh seed."

The results of crop experiments in other Provinces have been briefly noticed, but a very large literature on the subject exists, which it has been impossible, from want of space, to enter fully into. It may, however, be stated that the remarkable effect of nitre in increasing the outturn, above described, has been marked in nearly all cases in which it has been employed, in all sorts of soils.

HYDERABAD, MYSORE, KASHMIR.

HYDERABAD, MYSORE, KASHMIR. 765

In all these Native States wheat is an important crop, but it is impossible to deal with them in detail. Few accurate particulars are on record regarding them, and we can do little more than give an account of the areas and outturn estimated in the agricultural statistics of the Government of India. The averages during the four years ending 1887-88 and that for 1888-89 may be most conveniently represented in tabular form.

TRITICUM sativum.

Cultivation of Wheat.

CULTIVATION in Hyderabad, Mysore, Kashmír. *Conf. with* *p. 94.*

The figures are taken from the final report of the Revenue and Agricultural Department on the wheat crop of 1888-89:—

Native State.	1884-85 to 1887-88.		1888-89.	
	Area.	Outturn.	Area.	Outturn.
	Acres.	Tons.	Acres.	Tons.
Hyderabad	1,111,000	87,000	1,111,000	87,000
Mysore	14,000	1,700	4,282	1,700
Kashmír	500,000	133,000	500,000	133,000

ASSAM & BURMA. *Conf. with* *p. 94.*

766

ASSAM AND BURMA.

As already stated, the wheat crop in these provinces is at present of very little importance, though there is every probability that the area in Upper Burma, the climate and soil of many parts of which are admirably adapted to the growth of wheat, may undergo considerable expansion.

CHEMISTRY.

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CHEMISTRY OF WHEAT.

The composition of wheat-grain varies considerably, but this variation is confined almost entirely to the relative proportions of starch and of nitrogenous matters, although the mineral and other minor constituents are not quite fixed in amount. The starch may vary from nearly 70 to less than 61 per cent., while the nitrogenous matter may be found to the extent of anything between 10 and 16 to 17 per cent. Of the minor constituents, the ash may be increased in proportion to a small degree by a wet season, a thin-skinned, well-developed sample contains less fibre, and a plump dark-coloured grain has a larger proportion of oil or fat.

All Indian wheats are characterised by dryness, containing at least 2 per cent. less moisture than average English wheat, and are further remarkable for a high percentage of albumenoids. **Church** states that he has never yet met with an Indian wheat which contained less than 10 per cent. of albumenoids; while a large number of samples of first-rate English, Canadian, and Australian samples give numbers between 8 and 9. According to the same authority the average percentage of albumenoids in Indian wheat is about 13·5, but some are as low as 10·3, and some as high as 16·7. Albumenoids are much more abundant in hard than in soft wheats, while soft opaque grains are richer in starch. This has been clearly shown by **McDougall's** analyses of the starch and gluten in the various Indian forms (see p. 101) which, though scientifically inaccurate as a guide to the exact amount of nitrogen, is of value as shewing the comparative variation. Differences in the chemical composition of wheat-grain are said to be found not only in various cultivated races, but in the same sort when cultivated under different conditions of climate or season. Even in a single grain such variations may exist. **Forbes Watson** and other writers have frequently noticed the fact that the grain of many varieties is partly horny and translucent, partly soft and opaque, in which case its composition corresponds with its mixed appearance. **Church** affirms that variations in the percentage of albumenoids may frequently be observed even in the grains from a single ear, analysis showing sometimes 3 or 4 per cent. more albumenoids in certain of such grains than in others.

According to the same authority, who has had the opportunity of carefully analysing many samples, the average composition of Indian wheat is, in 100 parts,—water, 12·5; albumenoids, 13·5; starch, 68·4; oil, 1·2;

CHEMISTRY

fibre, 2·71 ash, 1·7. The "starch" in reality comprises about 2 per cent of the sugar or sugars found in many cereals, but this fact may be regarded as not appreciably affecting its food value. The ash, though not large in amount, is of great value as a source of mineral nutrients, when the grain is a staple article of dietary, containing as it does some 30 per cent. of potash and 45 per cent. of phosphoric acid.

"The various mill products obtained in grinding wheat differ much from each other and from the original grain, in several important particulars. For instance, the following figures were obtained in a series of analysis which I made of an entire series of such mill products:—

	Per cent. Nitrogen.	Per cent Oil
Whole wheat	1·692	2·02
Flour (white)	1·621	1·4
Flour (seconds)	1·967	1·82
Bran	2·143	2·75
Sharps (fine)	2·608	3·50

"These products represent but four out of a total of twelve, but they suffice to show how large a proportion of nitrogenous matter and of oil are rejected when fine flour is the sole product reserved for human food. It must not, however, be assumed that all the nitrogen, say, in fine sharps, is albumenoid; in fact, these fine sharps did not contain more than 13½ per cent. of albumenoids, though 2·608 of nitrogen corresponds to 16¼ per cent.; even the fine whiter or flour contained a little nitrogen in non-albumenoid forms" (*Church, Food-Grains of India, 95*).

USES OF WHEAT.

USES. 768

Food & Fodder.—The methods of employing wheat for human food in India vary somewhat, but the following may be accepted as the most important. From the GRAIN three chief kinds of flour are made, namely, *sújí*, *maida*, and *atta*. The first is a granular meal obtained by moistening the grain overnight, then grinding it. The fine flour passes through a coarse sieve, leaving the *sújí* and bran above. The latter is got rid of by winnowing, and the round, granular meal or *sújí*, composed of the harder pieces of the grain, remains. This preparation is in reality a sort of *semolina*, and is most easily produced from the hard wheats which contain a larger percentage of gluten. It is highly appreciated by all classes, but is expensive, and consequently only within the reach of the well-to-do. It is also employed in making confectionery, or in place of oatmeal in making a kind of porridge. The hard white wheats from which the best *sújí* is made, are, as already stated, admirably suited for the manufacture of macaroni, from their high percentage of gluten, and are exported to a considerable extent for this purpose to Southern Europe. *Maida* and *atta* may be prepared from the flour obtained in making *sújí* by regrinding it and passing it through a finer sieve, the finer flour which passes through being known as *maida*, and the coarser as *atta*. They are, however, generally prepared without moistening and separating the *sújí*, the grain being at once ground into *maida* and *atta*. *Maida*, or fine white flour, is, like *sújí*, a luxury of the richer classes; *atta* is the ordinary form in which wheat is consumed by the people. It is generally cooked in the form of flat cakes of unleavened bread, resembling a girdle scone, and known as *chapatti*, which constitute one of the chief articles of diet in many parts of India, especially amongst the Muhammadan population. *Chapattis* are eaten with *dal*, *ghi*, or any other relish. They are very simply prepared, namely, by kneading the flour with water, passing the dough with the hands into a flat cake, and baking it over a fire on an iron plate, or on a hot

Grain. 769

Sujі. 770

Maida. 771

Atta. 772

CHEMISTRY.

fibre, 2·7; ash, 1·7. The "starch" in reality comprises about 2 per cent. of the sugar or sugars found in many cereals, but this fact may be regarded as not appreciably affecting its food value. The ash, though not large in amount, is of great value as a source of mineral nutrients, when ... ie 30 per ... fer much ... particu- lars. For instance, the ... s of analysis which I made of an entire series of such mill products :—

	Per cent. Nitrogen.	Per cent Oil.
Whole wheat	1·692	2·02
Flour (white)	1·621	1·4
Flour (seconds)	1·967	1.82
Bran	2·143	2·75
Sharps (fine)	2·608	3·50

forms" (*Church, Food-Grains of India, 95*).

USES. 768

USES OF WHEAT.

Food & Fodder.—The methods of employing wheat for human food in India vary somewhat, but the following may be accepted as the most ...

Grain. 769

Sujt. 770

Malda. 771

Atta. 772

FOOD.

earthen platter. Fried with *ghi* and sugar, and seasoned with various condiments or spices, they form the chief substitute for bread amongst the well-to-do. In certain localities the *atta* employed is in reality produced not from pure wheat, but from the common mixed crops of wheat-barley or wheat-gram.

In the larger towns ordinary bread, prepared and leavened after the European manner, is said to be rapidly gaining favour with certain classes of the population; but, with this exception, fermented bread is little known in India. The qualities of the different Indian wheats as food-stuffs, and their adaptability to the requirements of bakers and millers in Europe, have been already discussed (see p. 101).

Wheaten straw, cut up as *bhusa*, is largely employed as a fodder for cattle, sheep, and horses, either alone or mixed with barley-straw and the haums of pulses. In the Panjáb and other parts of Northern India the young leaves are frequently cut for fodder, or sheep, and occasionally even cattle, are allowed to browse the young crop. Experiments have been made on Government Farms with wheat as a forage crop, but though much esteemed for this purpose in Japan, and later in Australia, the results in India have not been encouraging.

MEDICINE. Flour. 773 Starch. 774 Bread-Crumb. 775 Bran. 776

Medicine.—Wheaten FLOUR, STARCH, and BREAD-CRUMB are officinal preparations largely employed for many purposes. The flour is esteemed as an external application in erysipelas, burns, scalds, and various itching or burning eruptions. A mixture of flour and water is used as an antidote in cases of poisoning by salts of mercury, copper, zinc, silver and tin, and by iodine. BRAN, though not officinal, is sometimes used in the form of a decoction or infusion, as an emmolient bath, and also internally as a demulcent. Bran poultices are useful for many purposes, and bran bread is slightly laxative and may be used with advantage in certain dyspeptic conditions, and, owing to its freedom from starch, in diabetes. Starch prepared from wheaten flour is employed for sprinkling over inflamed surfaces, to absorb acid secretions and prevent excoriation. Mucilage of starch is valued in pharmacy for many purposes, and medicinally as a demulcent. In surgery it is occasionally employed for stiffening bandages, etc. BREAD-CRUMB is useful for giving bulk to pills, and for making poultices.

USES IN THE ARTS.—The well known properties of starch and mucilage of starch, and the value they possess in the arts, require no comment in such a work as the present. Wheaten starch is too expensive to be much employed for similar purposes by the natives of India, and is generally replaced by mucilage made from rice.

(*G. Watt.*)

TRADE IN INDIAN WHEAT.

INDIAN CONSUMPTION of WHEAT. 777 *Conf. with pp. 194, 197, 198.*

It might almost be said that no branch of Indian Commerce has attracted so much attention in Europe as that of Wheat. In point of value, however, to the people of India, the foreign traffic in that cereal is of comparatively little importance. To a very large extent Indian wheat is required to supplement deficiencies in the European supply, so that the trade is liable to the most violent fluctuations. It has been estimated that the annual average exports up to 1890-91 would not have fed above 1¼ millions of people, and that that quantity was but about 10 per cent. of the total wheat crop. Worked out from a yield of 7 maunds an acre the surveyed acres of India would (in 1890-91) have yielded 5,046,990 tons (*Conf. with p. 94*) The unsurveyed regions have been estimated to furnish 1½ million tons. The foreign exports for the year named were 716,024 tons, so that the Indian consumption may be said to have been little under 6 million tons. These general statements exhibit, therefore, the position and relative value of the foreign and internal traffic in wheat.

TRADE.

had been gradually matured India, up to a certain year, played no part in the time-honoured calculations of the European merchants, and her appearance in the corn-markets seems by many to have been viewed as introducing not only new disturbing elements, but as bringing with her new competitors. The vast area of India rose as a dream of future trouble—a potentiality of danger. The delusion that rice was the staple food of India, and, therefore, her chief agricultural crop, seems never to have been more rudely dispelled than by the emphatically demonstrated fact that, she not only grew wheat but was prepared to contest the foreign supply of Europe in that grain. The natural restrictions imposed on the future expansion of the trade by the climate and facilities of transport, and by

ing of the Suez Canal, and why it had in little more than ten years from that date assumed commercial importance, were questions that for many years escaped consideration. Indeed, it might almost be said that a large proportion of those most interested in the wheat trade barred India from their careful consideration, until the traffic had accidentally or purposely drifted into a peculiar groove, from which it has since vainly struggled to escape.

ADULTERATION. 778 *Conf with pp. 110-116, 186.*

other im- based on to certain e majority . But the American producers, backed by a vigorous Board of Trade, soon saw the necessity of reform, and that they effected by producing a cleaner article and by establishing their own "fair averages" on the other side of the Atlantic in "the graded system" which has ever since prevailed. America thus became able to dictate her terms so to speak

inferior wheat (for a time at least), to establish the standard that

TRADE. Refraction.

suited his own purposes. Into this aspect of the Indian wheat trade must undoubtedly be placed the much talked of system of "refraction," by which a fixed percentage of adulteration has, it might be said, been legalised. The defects and imperfections of the Indian wheat were accordingly hailed as subjects of infinitely more pressing moment than the possibilities of future expansion and improvement. It was widely proclaimed that the crude appliances of the Natives of necessity resulted in a dirty article, and that their practice of growing mixed crops occasioned unavoidably the presence of other and injurious grains among the wheat. These defects, it was urged, necessitated protective regulations. But it was not contemplated (or, if it had been, the result has frustrated the good intention) to establish inducements that would ultimately remove these defects. An arbitrary rate of "refraction" was fixed above which deductions could be made from contracts, but below which should be the shippers' gain. That being so, was improvement possible? Certainly not, and therefore the cultivator or the local small buyer soon realized that it was to his interest to see that his wheat was directly adulterated to the prescribed rate. Without, for the moment, attempting to deal with the question as to whether any other system might have been designed that would have tended towards improvement, it may, without fear of contradiction, be affirmed that the dictates of the shippers, or whoever fixed the refraction, called into existence in India direct adulteration. That the Natives can and do produce, when they so desire, a good quality of fairly clean wheat, no one will deny who is familiar with India or who has perused the extensive official correspondence that exists on this subject. Nothing more is paid for clean wheat than for wheat adulterated to the established standard. Two new industries, therefore, took their birth, namely,(1) organized adulteration (for which certain muds and grains were found more serviceable than others), and (2) that of cleaning the wheat. A premium has, in other words, been paid to the larger and more prosperous millers who can afford to erect cleaning machinery against the smaller millers who have had (and at the present moment have still) to either purchase Indian wheat specially cleaned or be debarred from participation in the new traffic in Indian wheat. Mr. Samuel Smith, of the Victoria Corn Mills, Sheffield, states, for example, that not more than one in twenty millers are in a position to be able to clean Indian wheat.

CLEAN WHEAT. 779 Conf. with p. 112.

QUESTIONS CIRCULATED to BRITISH MILLERS. 780 Conf. with p. 114.

That this state of affairs is not desired by the trade, as a whole, needs no further refutation than the replies furnished by the millers of Great Britain to the series of questions issued by the authorities of the India Office. One of those questions was—"Would you use larger quantities if free from admixture and impurity?" The answer sent by the vast majority was emphatically that they would. To whose interest is it, therefore, that the cultivators or small traders are compelled to adulterate, or rather that those of them who might find it to their interest to consign clean wheat, are practically prohibited from so doing? To whose interest is it, still further, that the millers of England are debarred from obtaining the full amount of Indian wheat that they desire? Mr. S. Smith says that among other reasons the English millers' objections to buy Indian wheat, on terms of *f. a. q.*, with a dirt clause of 5 per cent., are that the average sample which is to test the quality of delivery is a monthly preparation by the London Corn Trade Association over which the miller has no say. That the average sample varies considerably and thus affords no criterion to the millers what to expect in succeeding months. That in the case of arbitration the members of the London Corn Trade Association are the sole arbitrators. Further, that during arbitration the miller (however distant he may reside) has to attend the court at the port where

TRADE. Refraction.

the wheat was purchased. Also, that it is impossible to readily ascertain that not more than 5 per cent. dirt has been mixed with the wheat, etc., etc. As matters stand, the profits of the cultivator are, therefore, restricted, and a possible extensive wheat production is rendered impossible, very largely through the grain having to bear the enhanced railway charges and shipping freights on the percentage of dirt with which the wheat has to be adulterated before it is acceptable to the parties who have established and who maintain a fixed rate of refraction. All these additional charges the English consumer of Indian wheat has to pay, as also those occasioned through the process of cleaning. But it has been urged that in the present phase of the Indian wheat trade, there exist numerous difficulties that preclude the establishment of the graded system. Without admitting this argument as well founded, it may be repeated that a wholesome and much needed reform might in that case be effected by the establishment of the fair average quality (*f. a. q.*) on receipts not shipments. Arbitration is by no means saved by the existing system, and, indeed, it would not be materially increased were all sales to be made on individual samples instead of averages.

Difficulties of purchase. 781

The Council of the National Association of British and Irish Millers point out, however, the difficulty of purchase on actual samples of arrivals as follows:—

reward for quality and purity. Such a position is the only natural *incen-*

Buck has very properly pointed out that the existence of a large wheat trade is essentially a preventative measure against famine. Were non-food crops to be substituted for wheat, the country would be deprived of a store of food which restricts famine tendencies by becoming available when the price of the inferior grains rises to the level of wheat. It then becomes more profitable for the cultivator to sell his wheat for local use than to export it. A further rise in the price of food is thereby prevented.

POSITION of

Present Position and Character of the Trade.—The wheat that is usually exported is essentially grown for the foreign market and is therefore, more tl
majority of the
an article of fo
market and main
can wheat traffic, since the establishment of the graded system, affords abundant proof of the advantages of regulations that very largely fix the

TRADE, haracter of.

standards of sale in the country of production. It has been contended by some writers, however, that the improved facilities of transport and the cheapening of the rates, sufficiently account for that prosperity and for the hold America has been able to take on the European markets. These improvements, it has been even argued, are the sole cause of the fall in the price of wheat that has occurred within the past ten years or so. But surely the carrying agencies work for their own gain, with as keen an eye to that object, as in any other branch of human enterprise, and it is contrary to all experience to suppose that reductions would have been effected and facilities extended if the necessity for these had not been felt. America had to contend inch by inch for her present supremacy, and not the least important advance was the security of transactions attained by the graded system. In India, reductions in transit and freight charges have been made on a scale quite as great comparatively as in America, but in spite of these, the Indian trade has not advanced relatively to the same extent. The cause of this, as would seem, must be sought for in the defective system of an *f. a q* standard and in the clause that provides for, instead of prohibiting, adulteration. But there are writers on this subject who think the American carrying agencies have reduced their charges to the point where the traffic possesses little attraction. It is in fact contended that the carrying power of the world is in excess of its requirements, and that, with the increasing population of America and a protective legislation that fosters home industries, the time is rapidly approaching when less wheat will be available for export to Europe. Indeed, it has even been predicted that within a very few years the American export is likely to be entirely stopped. Any such revolution would of necessity bring India into the field as a very necessity in the European supply of wheat. But without entertaining such extreme views, it may be said India is even now a factor of no mean importance, as may be seen by the fact that the exports of wheat in 1891-92 were more than double those of 1890-91. In spite of all disadvantages and adventitious charges, Indian wheat has for some years continued to undersell the produce of the old and established supplies, and is gradually assuming a recognised position in the grain markets of Europe. The outcry has, accordingly, in certain quarters, been raised against the objections to this new traffic. Philanthropy, that much abused ally of a weak cause, has been called to the rescue. The natural food and surplus stocks of the people, we have been told, were being drained away from them. For greed of the means to satisfy exotic desires of modern civilization, the people were being induced to part with their ordinary food, and were, in consequence, taking to the use of inferior and unwholesome grains. These and such like wildly exaggerated statements have been seriously advanced as ascertained facts—and that too by persons who might have been better informed. Such absurdities do not, therefore, call for a scrutiny of the village granaries, since they can be abundantly refuted without treading on the susceptibilities of the people, or awakening their fears of fresh taxation. The trade in wheat, though up to the present moment it might almost be said to have rested on an insecure and unsatisfactory basis, similar to the position Indian tea occupied a few years ago, does not stand alone as a branch of Indian commerce that manifests an expanding supply to foreign markets. The total exports from India were in 1866-67 valued at £44,291,497 (nominal sterling), in 1871-72 they stood at £64,607,020, and in 1889-90 at £105,238,800. The total trade of India (imports and exports) had, in fact, manifested an average expansion of very nearly 5 per cent. for each year during the ten years ending 1889-90. The writer chooses to deal for the present with those years, because within that period wheat rose steadily to a very high level and then slowly declined. It has within the past two

ven. An export 783
rs ago In 1867

export trade with that of wheat. If, therefore, the people are being deprived of their wheat they do not seem to find it necessary to curtail their

the trade and not in others, and these fluctuations have borne no fixed relation to the downward tendency in silver. Would it, accordingly, lead to any satisfactory conclusion to seek out for each separate item some obscure *p.* 182.

should have been inversely affected have developed to a corresponding

TRADE.

Depreciation of Silver.

degree with the exports. And, moreover, the fluctuations of the wheat trade manifest no synchronous relation to the value of silver. On the contrary, the exports, instead of continuing to expand from 1886-87 with the fall in the value of silver, seriously contracted, and in 1891-92 suddenly doubled those of 1890-91. Without wishing to deny absolutely any advantage from depreciation of silver, it may safely be affirmed that such advantage must be more than effaced by the adventitious charges incident to refraction. The export of wheat from India can, however, be shown to be governed by the demand for wheat in Europe.

Some few years ago the writer contributed a paper "On the Conditions of Wheat Growing in India" to the Journal of the Royal Agricultural Society of England. He there stated:—"It is of little consequence whether the depreciation in the value of silver acts favourably or unfavourably, unless it can be shown that the existence of the wheat trade is vitally dependent on the fluctuations of the silver market. Many causes have doubtless combined to assist in the establishment of the present remarkable trade. The question at issue may be stated briefly thus: *Is the trade a good and natural one? Has it reached its maximum development?* The former will have to be answered, among other considerations, by an enquiry in India as to whether it is profitable to the cultivator, and in Europe as to whether it is meeting a demand which another country in the future may not more successfully contest. The latter can alone be solved by a somewhat detailed analysis of the sources of food-supply of the people of India taken in the light of the increasing population, the possible extension of agricultural operations, and the profitable establishment of new branches of industry or the growth of indigenous handicrafts. These are problems that represent the adjustment between productiveness of soil and man's inventive resources." "Far more will depend in the future on the growth of our cotton, jute, woollen, paper, oil, and other mills, than on the special demands of Europe for Indian wheat. Indeed, thoughtful men in India are beginning to speak in an undertone of India's agricultural prosperity as her greatest source of weakness. But it is an open question whether Europe would suffer most under the importation of a large surplus of cheap agricultural produce, or in having the Indian market closed to European goods through the growth of local industries." "Influences of a perfectly natural character have, during the past twenty or thirty years, been operating favourably to the wheat trade—have, in fact, been developing every branch of India's foreign commerce. Some of the more important of these may be here exhibited."

INFLUENCES AFFECTING INDIAN WHEAT TRADE.
785

The area of India is 1,382,624 square miles, and it possesses the climates and soils of the world. Its agricultural possibilities are, therefore, almost limitless. The population is rapidly increasing. The surveyed agricultural area of India is about 600 million acres, or a little less than half the geographical area of British India. The area of actual cultivation fluctuates from year to year, but on an average about 100 million acres are usually returned as available for future agricultural expansion. Among the modern facilities that have been effected, the opening of direct telegraphic communication (in 1865) between England and India may be mentioned. It was thus rendered possible to exchange a knowledge of the conditions of both markets at any given time.

Telegraphs.
786

The Suez Canal, already alluded to, was opened in 1869, by which the time necessary to deliver goods from India was reduced from three or four months to as many weeks.

Suez Canal.
787

The opening of the Prince's Docks, Bombay, enabled the shippers from that port to carry on work throughout the year, whereas formerly the monsoons practically stopped the export trade. The similar greatly improved facilities at Karachi have made that port one of vast importance and that, too, within the past few years. Railway communication has also been rapidly extended, thus not only increasing the

Docks.
788

TRADE INCREASED FACILITIES.

Railways. 789

Bengal are shown to have declined from 6,668,047 cwt. in 1881-82 to 1,340,355 cwt. in 1890-91, while during the same period the exports of Karachi expanded from 1,852,334 cwt to 6,767,300 cwt. The trade from Bengal manifested a revival in 1891-92, but by no means recovered its lost ground Indeed, it is impossible to avoid the conviction that the rapidity with which India is progressing may sometimes temporarily act almost prejudicially in upsetting established agencies or channels of trade before others have become fully able to take their places.

Irrigation Canals. 790

Internal Interchanges 791

It may now perhaps be admitted as quiet unnecessary to call in the aid of the theory of the depreciation of the value of silver, or indeed of any other obscure theory, when we pass in silence the thousand and one benefits the country has derived from a peaceful administration, from the

FREEDOM of TRADE. 792

at which Indian wheat has been recently offered in England. The ent, be due to an advantage the value of silver. He holds ontinuously decreasing rate at he home markets had largely

INFLUENCE of Indian Wheat.

assisted in the general fall in the price paid for wheat all over the world. "It has been pointed out," he says, "that the exports of wheat from India were not considerable until 1881-82, and, whether it be merely a coincidence, or more than that, it is a fact that the average annual price of wheat in England has been permanently below 45s. a quarter only since 1882. It has further been remarked that we must consider the total supplies of Indian wheat to Europe, and not those received in England only, in endeavouring to form a fair estimate of their effect upon prices here." Mr. Bear then furnishes the following table:—

Wheat and Flour imported into the United Kingdom.

	1881. Qrs.	1885. Qrs.	1886. Qrs.	1887. Qrs.
India	1,693,560	2,809,676	2,544,725	1,963,637
United States	10,547,144	8,985,730	8,983,880	11,615,950
Russia	947,147	2,788,244	872,802	1,282,312
Other sources	3,276,301	4,175,562	2,782,664	3,220,108
TOTAL . .	16,464,152	18,759,212	15,184,098	18,082,007

"These figures," he continues, "show that our receipts of wheat from India, which in only one previous year had been as much as 5 per cent. of our total foreign supplies, rose to 10·3 per cent. in 1881 to 15 per cent. in 1885, and to 16·7 per cent. in 1886. Surely such proportions are large enough to account for a great fall in prices, considering that they represented receipts from a new source of supply. It is true that the proportion fell to 10·9 per cent. in 1887, when American supplies were unusually large and Russian contributions considerable; but that was after prices had been brought down to an extremely low level, and is to be explained by the unusual deficiency of the crop of Indian wheat in 1887, following a crop below the average in 1886." "Moreover, we received more wheat from Russia on account of extensive Indian exports to Italy than would otherwise have come to us." It thus, as Mr. Bear forcibly demonstrates, becomes imperative to take India's supplies of wheat to the Continent (as well as to England) into account in any endeavour to fix the share which India has played in lowering the value of wheat. And not the consignments to the Continent alone, but those to Egypt as well, since the Egyptian imports from India are largely re-shipped to Europe. The Table I. (p. 187) in column I. shows the total exports of wheat from India during the twenty-one years ending 1891-92, the returns for the last year being subject to revision and correction. Columns V. and VI. analyse these exports into the two chief sections, *viz.*, consignments to the United Kingdom and to Egypt, and the Continent. The total of these two columns will be seen to be very nearly the quantity shown in column I., and indeed all that has been omitted are the supplies furnished to Malta, Arabia, etc. The Table II. (p. 189) will be seen to analyse the wheat export trade of India more fully by displaying the countries of the Continent to which the grain is consigned, as also the shares taken in the traffic by the chief exporting provinces. For the contention that it is at present desired to urge, however, attention need only be directed to the former—Table I. It will there be seen that during the past ten years at least the returns in column VI. (the Continent and Egypt) exceed those in column V.,—the United Kingdom. Any attempt, therefore, to exhibit the effects of the exports to the United Kingdom on the price of

INFLUENCE of Indian Wheat.

wheat in England [illegible] must have release [illegible] hence the total su[illegible] as those to Egypt. Last year (1891-92) these came to 29,472,137 cwt. or very nearly 1½ million tons. By way of passing, attention may be given to column vii. in Table I. which displays the total export of rice from India. It will there be seen that, until last year, the rice trade has for many years past been fully twice as valuable as the wheat, a fact which demonstrates the absurdity of the contention that in the wheat exports we [illegible]

PRICES. 794

[illegible]

seers only, as compared with 17·04 seers for the previous sixteen years [illegible]

Mean averages 795

[illegible]

by Mr. O'Conor [illegible] If, therefore, years of scarcity and years of [illegible] wheat is [illegible] to have [illegible] North-West Provinces, during the period [illegible] Chambers of Commerce [illegible] however, that the [illegible]

TRITICUM sativum.

Prices of Indian Wheat.

PRICES.

affected the local market. But in the writer's opinion little good is derived by an analysis of the returns of prices in the light of *the possible influence on these of the export traffic*. The error of disregarding the balance between province and province, in food supply, which the extension of facilities of internal transport is effecting, is so great that, it might almost be said, the disturbances of famine and of superabundance are to some extent permanent in their effects. The liability to famine or scarcity, of necessity gives advantage to tracts not so subjected. The nature of the agriculture changes in consequence. The crops grown in the regions exposed to the possibility of drought are those best calculated to withstand the danger. An interchange takes place in obedience to the controlling power of supply and demand. The extension of the irrigation measures is giving to regions once periodically liable to extremes of drought a security that is rapidly changing the nature of their agriculture, and in this change the wheat area is very largely expanded.

Effect of Increased Facilities. 796

The effect of increased facilities of transport may be affirmed to be to lower rates where they were formerly abnormally high, and to raise them where once they were ridiculously low. Indeed, so keenly are the provinces of India entering into competition, that a famine may be seen to deprive a province or district of a once profitable industry or branch of agricultural enterprise—the temporary disturbance giving supremacy to its rival. This is the natural effect of improved facilities for interprovincial trade, a trade which year by year betokens the prosperity of the country at large, both in agriculture and in manufactures. The resources and enterprise of the people of India of to-day are not only effacing the deadening influences of the anarchy that formerly prevailed, but are acting and re-acting on the foreign imports and exports. That the production of food-stuffs in India has, during the British supremacy, immensely expanded, needs no further proof than the existence of a large foreign trade, which a quarter of a century ago did not exist. While the population has immensely increased, the advance in the price of the necessaries of life has not exceeded the enhancement of the value of labour. Indeed, it might with perfect safety be said that in no other country in the world has national prosperity and advancement, preserved to the labouring classes, a cheaper and more abundant supply of food than in India.

Effect of Foreign Export Trade. 797

But if it be admitted that the foreign exports of wheat have *not raised* the price of that grain to the Indian consumer, can it also be said that the keen competition witnessed within the past few years has preserved wheat cultivation as a remunerative industry? The conditions of one province are often so widely different from another; indeed, the conditions of one district or of one cultivator are often so dissimilar from another, that the statement of cultivation that might be framed by one investigator would be at variance with that of another. Little good can, therefore, be obtained by publishing estimates of cost of production and profit. The problem is better judged of by general than individual principles. In other words, the returns of the wheat area, of the foreign transactions, of the prices paid by the wholesale dealers and other such features of the trade, afford more trustworthy data than the returns of individual estimates. The subject of the area of wheat cultivation has already been dealt with; the present chapter in the tables below furnishes a statement of the position of the trade; and the subject of the prices paid for wheat by the exporters and of the price of the grain in India has repeatedly been shown, pp. 116-118. It may suffice, therefore, to deal here with this subject in its widest and most general aspects. It may be said that the fall in the price realized in Europe for Indian wheat down to 1891 has in no way affected the Indian cultivator. He is as willing to cultivate the grain to-day as he was ten

RAILWAY CHARGES and FREIGHTS.

years ago. Indeed, as already shown, the exports in 1891-92 were more than double those of 1890-91, and, so far as the monthly returns of the current trade show, the year 1892-93 bids fair to exceed that of 1891-92. The future is, however, more influenced by the uncertainty of the trade to the merchant than to the

already touched, but
been profitable to the
more on America than
point is rapidly being
reached when America will find it more profitable to retain than to export her wheat, India may be expected to advance; but if America considers it possible and desirable to hold her supremacy in the wheat market, India is likely to fluctuate backwards and forwards, but to advance only slowly, until the wholesale reforms are effected that would place it in a position to cont
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is at once established by the fact that wheat alone of the articles of Indian export has materially improved. Most articles of Indian export have in fact declined, during the recent term of rapid expansion in the wheat trade.

Conf. with pp. 182-3

Charges 798

Some conception of the effects of past competition may be learned from the following table compiled from a series of returns issued by the Calcutta Chamber of Commerce:—

——		May 1871.	August 1871.	May 1886	August 1886
Exchange	D/Payment 6 M/S	1s. 10 1/8d.	1s. 11 3/16	1s. 5 13/16	1s. 4 5/8d
	D/Payment 3 M/S	1s. 10 5/8d.	1s. 11 1/8	1s. 5 13/16	1s 4 1/2d
Price	England, per 492lb	——	——	31s. 7 1/2	31s
	Calcutta, per Bengal maund	R2-5-0	R2-3-0	R2-8-6	R2-11-0
Freight	per 100 maunds, rail, Cawnpore to Calcutta	R83	R83	R53	R53
	per ton, steamer, Calcutta to London	£3-10-0	£3-10-5	£1-10-0	£1-7-6
Shipping charges at Calcutta		R1 a ton		R0-12-0 a ton	
		cwts.		cwts.	
Export trade	Bengal	205,138		4,189,672	
	Bombay	33,351		10,608,680	
	Sind	7,323		6,241,017	
	Madras	2,710		21,150	
	TOTAL	248,522		21,060,519	

Prices of Indian Wheat.

PRICES.

affected the local market. But in the writer's opinion little good is derived by an analysis of the returns of prices in the light of *the possible influence on these of the export traffic.* The error of disregarding the balance between province and province, in food supply, which the extension of facilities of internal transport is effecting, is so great that, it might almost be said, the disturbances of famine and of superabundance are to some extent permanent in their effects. The liability to famine or scarcity, of necessity gives advantage to tractsnot so subjected. The nature of the agriculture changes in consequence. The crops grown in the regions exposed to the possibility of drought are those best calculated to withstand the danger. An interchange takes place in obedience to the controlling power of supply and demand. The extension of the irrigation measures is giving to regions once periodically liable to extremes of drought a security that is rapidly changing the nature of their agriculture, and in this change the wheat area is very largely expanded.

Effect of Increased Facilities.
796

The effect of increased facilities of transport may be affirmed to be to lower rates where they were formerly abnormally high, and to raise them where once they were ridiculously low. Indeed, so keenly are the provinces of India entering into competition, that a famine may be seen to deprive a province or district of a once profitable industry or branch of agricultural enterprise—the temporary disturbance giving supremacy to its rival. This is the natural effect of improved facilities for interprovincial trade, a trade which year by year betokens the prosperity of the country at large, both in agriculture and in manufactures. The resources and enterprise of the people of India of to-day are not only effacing the deadening influences of the anarchy that formerly prevailed, but are acting and re-acting on the foreign imports and exports. That the production of food-stuffs in India has, during the British supremacy, immensely expanded, needs no further proof than the existence of a large foreign trade, which a quarter of a century ago did not exist. While the population has immensely increased, the advance in the price of the necessaries of life has not exceeded the enhancement of the value of labour. Indeed, it might with perfect safety be said that in no other country in the world has national prosperity and advancement, preserved to the labouring classes, a cheaper and more abundant supply of food than in India.

Effect of Foreign Export Trade.
797

But if it be admitted that the foreign exports of wheat have not raised the price of that grain to the Indian consumer, can it also be said that the keen competition witnessed within the past few years has preserved wheat cultivation as a remunerative industry? The conditions of one province are often so widely different from another; indeed, the conditions of one district or of one cultivator are often so dissimilar from another, that the statement of cultivation that might be framed by one investigator would be at variance with that of another. Little good can, therefore, be obtained by publishing estimates of cost of production and profit. The problem is better judged of by general than individual principles. In other words, the returns of the wheat area, of the foreign transactions, of the prices paid by the wholesale dealers and other such features of the trade, afford more trustworthy data than the returns of individual estimates. The subject of the area of wheat cultivation has already been dealt with; the present chapter in the tables below furnishes a statement of the position of the trade; and the subject of the prices paid for wheat by the exporters and of the price of the grain in India has repeatedly been shown, pp. 116-118. It may suffice, therefore, to deal here with this subject in its widest and most general aspects. It may be said that the fall in the price realized in Europe for Indian wheat down to 1891 has in no way affected the Indian cultivator. He is as willing to cultivate the grain to-day as he was ten

RAILWAY CHARGES and FREIGHTS.

to contest the market on more rational grounds than at present. In a recent article in the *Economist*, however, it has been held that the consumption of wheat in the world has overtaken production, and that in ... ch a rise has since ... cordingly manifested ... the value of silver ... he articles of Indian export has materially improved. Most articles of Indian export have in fact declined, during the recent term of rapid expansion in the wheat trade.

Conf. with pp. 182-3.

Charges.
798

		May 1871.	August 1871.	May 1886.	August 1886.
Exchange	D/Payment 6 M/S	1s. 10[illegible]d.	1s. 11[illegible]	1s. 5[illegible]	1s. 4[illegible]d.
	D/Payment 3 M/S	1s. 10[illegible]d.	1s. 11[illegible]	1s. 5[illegible]	1s. 4[illegible]d
Price	England, per 492lb	——	——	31s. 7½	31s.
	Calcutta, per Bengal maund	R2-3-0	R2-3-0	R2-8-6	R2-11-0
Freight	per 100 maunds, rail, Cawnpore to Calcutta	R83	R83	R53	R53
	per ton, steamer, Calcutta to London	£3-10-0	£3-10-5	£1-10-0	£1-7-6
Shipping charges at Calcutta		R1 a ton		R0-12-0 a ton	
Export trade		cwts.		cwts.	
	Bengal	205,138		4,189,672	
	Bombay	33,351		10,608,680	
	Sind	7,323		6,241,017	
	Madras	2,710		21,150	
TOTAL		248,522		21,060,519	

TRITICUM sativum.

Prices of Indian Wheat.

RAILWAY CHARGES and FREIGHTS.

Reduction.
799

It will thus be seen that very nearly as great reductions on transit charges and shipping freights have been accomplished in India as can be shown to have been effected in America. The railway charges per 100 maunds have fallen since 1871 from R83 to R53, and more recent returns, due to increased facilities towards Bombay, have still further lowered the rates to and from that port. But to confine observation to the figures furnished by the Chamber of Commerce: the steamer freights from Calcutta to London have been lowered from £3-10-0 to £1-7-6. The shipping charges have also decreased from R1 to R0-12-0 a ton. But while all these reductions have been brought about, the price paid for the wheat was R2-5-0 per maund in 1871, with exchange at 1s. 10$\frac{1}{16}$d.; and in 1886 R2-11-0 for the same quantity with exchange at 1s. 4$\frac{1}{3}\frac{1}{2}$d. The Chamber does not furnish the ruling price in England for Indian *f. a. q.* wheat during 1871, but in 1886 it had fallen to 31s. a quarter. An idea of the fluctuations of the London price paid for Indian wheat may be derived from the following quotations:—In 1879, 46s. 3d.; in 1880, 49—50s.; in 1881, 40—49s; in 1882, 40—47s.; in 1883, 35—43s.; in 1884, 28—38s.; in 1885, 31—33s.; and in 1886, 30s. 9d. to 31s. 7$\frac{1}{2}$d. A vast improvement took place in 1891-92, with the result that the exports of that year were double those of 1890-91, while the exchange had not, on the whole, materially altered till towards the close of the year, when the depreciation effaced the temporary rise of 1890-91. On this subject Mr. O'Conor says, "It may be said that all the world over, the months of March and April saw wild excitement and speculation in the wheat trade with a swift upward rush of prices. India was no exception. Between the end of January and the end of April (1891) prices rose in Karáchí by 17 per cent., in Bombay by 19 per cent., and in Calcutta by between 14 and 15 per cent. In all three places, however, prices have since fallen substantially." "On the whole, it seems clear that the excitement which temporarily prevailed in the wheat market in India, consequent on the sudden rise of prices in Europe, led to a very considerable rise in both wholesale and retail prices for a couple of months, but that as the excitement passed away, prices dropped again, and that they are not now, except in the Panjáb, very appreciably in excess of the prices prevailing about the end of December. Nor are they much, if anything, in excess of the prices which ordinarily ruled since first the wheat of India found an assured opening in Europe." While the English price thus steadily declined for several years the Indian fluctuated but if anything improved. In 1878 R3-9, R3-8, R3-8, and R3-6 in May, June, July, and August, respectively, and in 1886 for these months R2-8-6, R2-10-6, R2-10-0, and R2-11-0 per maund. It is thus probable that a large share of the advantage shown by the reduction of railway and other charges went to middlemen, not to the cultivator, since the rise in the price paid bears no relation to the reductions effected. In the Report of the Bombay Chamber of Commerce for the year 1891, the prices of wheat and freight charges are given. From the weekly returns the following abstract may be found useful:—

PRICES.
800

EXCHANGE, FREIGHTS and PRICES.

Exchange, Freights to London; and Prices of Wheat (per cwt.) that ruled in Bombay during the first week of each month for the year 1891.

	January, 9th	February, 6th	March, 6th.	April, 3rd	May, 1st	June, 4th.	July, 2nd	August, 6th.	September, 3rd	October, 2nd.	November, 6th.	December 4th
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
EXCHANGE—												
Sight	0 1 6¼	0 1 5⅞	0 1 5¾	0 1 5¾	0 1 4 15/16	0 1 4 15/16	0 1 5 1/16	0 1 5 13/16	0 1 5 7/16	0 1 5 3/32	0 1 4 13/16	0 1 4 11/16
3 months	0 1 6 1/16	0 1 6	0 1 5¾	0 1 5¾	0 1 4 15/16	0 1 4 15/16	0 1 5⅜	0 1 5 7/16	0 1 5 5/16	0 1 5¼	3 1 4 13/16	0 1 4 11/16
6 months	0 1 6¼	0 1 6 1/16	0 1 5 9/16	0 1 5¾	0 1 5 1/16	0 1 5 1/16	0 1 3 15/16	0 1 5 5/16	0 1 5 7/16	0 1 5 7/16	0 1 4¾	0 1 4¾
FREIGHT—												
A ton to—												
Liverpool . . .	0 16 6	1 3 0	1 2 6	1 6 6	1 9 0	1 4 6	0 17 6	1 1 3	1 2 3	0 18 0	0 19 0	1 2 6
London	0 16 3	1 2 6	1 2 6	1 3 9	1 6 3	1 8 9	0 16 9	1 0 0	1 1 3	1 0 0	0 18 9	1 1 3
CLASSES OF WHEAT IN CWT.—	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.
(1) White Pessy . .	4 9 9	4 9 3	4 11 6	5 1 0	5 1 0	5 8 0	5 3 0	5 4 0	5 8 6	5 9 0	5 11 0	5 14 0
(2) Ahmedabad (soft red) .	4 8 6	4 5 0	4 8 6	4 10 6	4 14 0	4 14 6	4 13 6	4 12 6	5 0 0	4 14 0	5 0 6	.
(3) Laskari . . .	3 8 0		..					.	.	.	..	..
(4) Yellow hard . .	3 11 0	3 12 0	4 2 0	4 2 0	4 7 0	4 7 0	4 4 0 to 4 7 0	4 6 6	4 13 0 to 4 15 0	4 13 0 to 5 1 0	5 1 0 to 5 3 0	5 8 0 to 5 11 6
(5) Delhi No. 1 (White Pessy).	4 8 6	4 6 6	...	4 13 0	4 13 6	4 11 0	4 11 6	4 12 6	5 3 0	5 3 6	5 5 6	5 6 3
(6) Delhi No. 2 (Red) .	4 4 0		4 4 6	4 6 6	4 8 0	4 8 0	4 6 0	4 8 0	4 14 0	4 15 0	5 0 0	5 1 6
(7) Hard Red Khatha .	3 13 0	3 10 0	3 13 6	3 15 0	4 4 0	4 3 6		4 4 6	4 10 0	4 11 0		..
(8) Nagpore Khathi .	4 2 6	4 0 6	4 6 0	4 6 6	4 11 0	4 7 6	4 7 0	4 8 0	5 0 0	5 0 0	5 0 6	5 1 6

Prices of Indian Wheat.

EXCHANGE FREIGHTS and PRICES.

In order to illustrate the relation of the trade to the value of silver, it may be said that the year 1889 showed, for the first week of each month, as follows:—Sight 3rd January, 1*s.* $4\frac{7}{16}$*d.*; 7th February, 1*s.* $4\frac{19}{32}$*d.*; 7th March, 1*s.* $4\frac{1}{2}$*d.*; 4th April 1*s.* $4\frac{11}{32}$*d.*; 2nd May 1*s.* $4\frac{3}{16}$*d*; 3rd June, 1*s.* $4\frac{1}{8}$*d*; 1st July, 1*s.* $4\frac{1}{8}$*d.*; 5th August, 1*s.* $4\frac{3}{16}$*d.*; 2nd September, 1*s.* $4\frac{9}{32}$*d*; 3rd October, 1*s.* $4\frac{11}{32}$*d.*; 7th November, 1*s.* $4\frac{13}{32}$*d.*; and 5th December, 1*s.* $4\frac{7}{8}$*d.* Now these figures fairly represent the rates that ruled throughout the year: exchange may be said to have been constant but to have preserved a very slightly lower level than during 1891. Prices of wheat were also fairly constant. The year opened with white Pessy at R5-2 and it fell slightly, the lowest record being R4-4 and the mean R4-7. To show the further history of exchange and prices, it may be useful to give the returns for 1890:—Exchange at sight 3rd January, 1*s.* 5*d.*; 6th February, 1*s.* $5\frac{1}{4}$*d.*; 7th March, 1*s.* $5\frac{7}{32}$*d.*; 3rd April, 1*s.* $5\frac{3}{32}$*d.*; 1st May 1*s.* $5\frac{23}{32}$*d.*; 5th June, 1*s.* $5\frac{7}{8}$*d.*; 3rd July, 1*s.* $6\frac{9}{32}$*d.*; 1st August, 1*s.* $7\frac{7}{16}$*d.*; 4th September, 1*s.* $8\frac{3}{32}$*d.*; 3rd October, 1*s.* $7\frac{3}{8}$*d*; 7th November, 1*s.* $6\frac{1}{4}$*d.*; 5th December, 1*s.* $6\frac{3}{16}$*d.* The American action which temporarily raised exchange is a subject too well known to call for any special remarks here, but the effect on prices of wheat is worthy of consideration. The year opened with white Pessy at R4-8-6 a cwt., and the following were the rates during the first week of each of the remaining months:—R4-6-0; R4-4-6; R4-6-0; R4-7-0; R4-6-0; R4-6-0; R4-6-6; R4-5-6; R4-6-6; R4-10-0, and R4-9-6. The remarkable rise in exchange did not, therefore, cause anything like a corresponding decline in the price of wheat at the port of Bombay. The selection of one week in each month and of one particular kind of wheat has been made to simplify the quotation of figures. This treatment exhibits nothing peculiar or different from what could be shown by

Incentive to speculation. 801

the analysis of the returns for any other term or kind of wheat. It will thus be seen that in comparison with the table for 1891, the behaviour of exchange cannot be regarded as affording indications of any direct gain to shippers, though, as pointed out elsewhere, a steady decline in exchange is an incentive to speculation. Exchange preserved a lower level in 1889 than in 1891, and yet the exports of the former year were less than half those of the latter. The financial year of India goes from the 1st April to the 31st March, and the Bombay Chamber of Commerce dates its year from 1st January to 31st December. This ambiguity is, however, in the wheat trade not of very serious moment, since the chief shipments are made in the months embraced by both systems. Thus while the foreign exports of 1890-91 (practically the year 1890 of the commercial returns) were only 14,320,496 cwt., those of 1891-92 (*i.e.*, 1891) became 30,306,989 cwt. It may fairly be asked, therefore, what does the rate of exchange in these years manifest that could by itself account for so immense a development? Practically nothing, until the further consideration of the rise of prices in Europe is called into account; it then becomes apparent that the tendency to a fall in exchange became an inducement to traffic, seeing that prices in India had not manifested so great a rise as in Europe, and that freights were if anything easier.

Conf. with pp. 179, 183.

DEPRECIATION OF SILVER. 802

Conf. also with p. 173.

Depreciation of Silver.—The subject of the depreciation of the value of silver has been incidentally alluded to in one or two passages above, but it may serve a useful purpose to attempt, very briefly, to exhibit here the direct bearings of this much-hackneyed controversy on the Indian wheat trade It need scarcely, however, be said that what is true of the influences of a fluctuating currency on wheat must be true also of every article of Indian commerce. The exceptions (and these are only partial exceptions) would be in the traffic in articles, such as Indigo, Jute, Rice, etc., of which India may be accepted as holding a monopoly, sufficiently strong to enable her to control the market.

TRITICUM sativum.

DEPRECIATION OF SILVER.

The rock upon which most persons have wrecked their theories and contentions on the silver question has been disregard of the constant adjustment that must take place in the markets of the world on any important article of trade becoming depreciated in value. Individual experience is too often used as an argument unanswerable and unerring, even although the inference drawn, be clearly at variance with the commonest principles of supply and demand. The other day, for example, a gentleman largely interested in Indian wheat assured the writer that "if a merchant can now purchase two shillings worth of wheat with one shilling and three pence, he is and must be a gainer by very nearly the difference between these figures." Now that statement ignores the fact that the one shilling and three pence, through the appreciation of gold, purchases the same or very nearly the same amount of return goods as was obtained by the two shillings formerly paid for the rupee's worth of wheat. These figures are, moreover, inaccurate in more respects than one since they disregard the effect of reduction in transit charges, and put on one side the influence of the fall in the price of wheat itself. But we may accept these quotations of prices, for the sake of argument, without their absolute or even relative values being questioned. If then any such advantage has been secured, the exports of India relative to the imports should have immensely increased. So large a gain would certainly have augmented the demand and given a greater return to the cultivator, since the exporter would have received more and been thus in a position to pay more. Conversely the import trade should have declined. But, during the past 10 or 15 years, not only has the expansion of the imports kept pace with the exports but the Indian cultivator has not received the enhancement of prices that competition would of necessity have secured. Witness the actual returns of the exports and imports during the last two years: total exports of India in 1889-1890 £105,355,000 and imports £86,653,900: exports in 1891-1892 £102,338,200 and imports £93,910,300 (nominal sterling). Now, while exchange reached its lowest ebb and wheat exports their highest level, the total exports of India declined by 3 millions and the imports improved by 7 millions. It is a fundamental principle in the commercial relations of all civilized nations that the exports pay for the imports. On this subject Mr. O'Conor writes:—"If exports increase while imports diminish the fact can only signify, either that the country is borrowing capital in foreign countries, or that it is giving away its produce for nothing. If the value of imports increases in greater proportion than the value of exports, the fact can only signify that the country has been lending money to other countries and is receiving back interest on its capital." But this line of argument may be extended. To allow of the profit assumed above, it must be accepted that the prices of the articles imported by India in exchange for her wheat, have remained stationary. Had they, meantime, risen in value, India would have got less for her wheat than formerly, and had they declined she might have got more. Now, as a matter of fact, the articles of European manufacture that India imports have fallen in value, so that the so-called one shilling and three pence worth sent to India for the rupee's worth of wheat is the same in amount and quality now as when the rupee had its par value. Were it otherwise the fall in the value of silver would have assumed the form of a direct bounty to local industries. An import duty was, some few years ago, levied by India on manufactured (piece) goods. The advocates of free trade regarded that duty as debarring the peasantry of this country from obtaining the full advantage of their dealings with England. Its removal was demanded and complied with, the result being the loss of a large revenue to the country without a concomitant reduction in the price paid by the people for their few yards of cotton goods.

Exports pay for Imports.
803

Conf. with p. 179.

Prices of Indian Wheat.

DEPRECIATION OF SILVER.

The advantage went to the retail dealer, not to the consumer. But to be consistent, it is now necessary to ascertain clearly if any undue advantage be obtained by the exporters of Indian produce through the depreciation of silver, since such advantage would of necessity be a burden thrown on the rate-payers of India, far in excses of the loss annually sustained by the Government in the payment of its European liabilities. A gain on export, must, as already stated, amount to a bounty on local manufactures and against imported goods. The old duty on foreign piece goods was 5 per cent., the depreciation of silver, during the past 15 years, has averaged from about 20 to 37 per cent. If, therefore, a gain exists by depreciation, we have to assume that Manchester (by way of specific illustration) is now being permitted to swindle the people of India by sending literally only 1s. 3d. worth of the cloth formerly supplied in return for the 2s. worth of wheat. It goes without saying, therefore, that this illustration can be accurate only were it possible to prove that the value of Manchester goods had remained stationary. If they have fallen in value till the purchasing power of 1s. 3d. is the same as the 2s. of former years, the gain must be regarded as a pure hallucination. Now, during the period when the mean fall in exchange may be accepted as approximately 25 per cent., Manchester goods became cheaper by fully 30 per cent., so that these articles can be (and have been) sold at very nearly 10 per cent. less than formerly. There would thus appear to be a gain to the consumer of foreign imported goods, but certainly no gain to the exporter; indeed, had railway charges and shipping freights not been materially reduced, the wheat trade of India must have ceased to exist. The fall in the price of wheat in India and the still greater fall that took place in Europe (during certain years) for that commodity, together with the reductions in transit and other charges, have been so adjusted on each other as to allow the trade a narrow margin of profit. But it would not be difficult to show that the gain on imports, illustrated above, must be more than effaced by the national losses on home remittances through exchange, so that the opinion would seem fully justified that Indian commerce is unfavourably influenced by the fluctuations of the silver market. These fluctuations when they show a downward tendency, afford, however, a distinct inducement to speculation. A temporary gain may thus be attainable by the buyer who is fortunate to find a fall in exchange since his purchase. Whenever the downward tendency assumes a degree of fixity, that is, when it manifests a likelihood to remain so, for an appreciable time or to fall still lower, prices are at once adjusted and the advantage becomes transitory or accidental, but is never inherent nor constant. The advantage, if it be called so, that is thus possible, partakes very largely of the nature of gambling rather than of legitimate commercial gains. It is more reprehensible than commendible and works evil rather than good, since it tends to keep India in the position which it largely holds at present, *viz.*, that of meeting occasional and speculative markets instead of assuming the status of a fixed and natural trade.

England's loss through Fall in Silver. 804

Depreciation encourages speculation. 805

Mr. O'Conor puts this feature of the trade forcibly thus:—"It is the constant tendency to a fall in exchange which has encouraged speculation, but if exchange instead of falling from 1s. 6½d. to 1s. 4¾d. had fallen in the same interval from 1s. 9d. to 1s. 7d.,—that is, if the average rate had been largely higher than the rate which has prevailed—the effect would have been the same. While exchange is rising, importers hasten to bring in their goods, and when it is falling, exporters hasten to ship their goods, for, in each case, a transaction which has begun on a certain basis of exchange will bring in a much larger profit than was anticipated if, before the goods are delivered, exchange rises for imports or falls for exports. It is a purely temporary stimulus which dis-

appears with the readjustment of prices and freights which always takes place, but while it lasts it induces speculation and if the course [illegible] steadily upwards or steadily downwards, it causes a profit to the importer or exporter. It is this temporary effect of fluctuations of exchange which has caused the "practical man of business" to assert that a low exchange is beneficial to the country because it encourages the export trade [illegible] such a gambling element should be a governing factor in India's trade is scarcely likely to be regarded as a recommendation for the present monetary system. Indeed, viewed from every aspect of the case, the direct and indirect advantages claimed are of so unsatisfactory a character that were they admitted as existing in every transaction, the wheat trade should be viewed as a national calamity, which it would be [illegible] an export duty, such as rice is made to bear at the present day. [illegible] emphatically be said that no direct gain can possibly be [illegible] the fall in the value of silver and therefore that the Indian wheat trade is a perfectly natural one which each year is [illegible] to become more securely established than heretofore. It is perhaps needless to [illegible] evidence against the theory of gain; but it may be added that if any advantage occurs through the depreciation of silver would it not be natural to expect a synchronous relation in the fluctuations of the export traffic with the variations in the monetary standard? That this has not been the case may at once be learned by an inspection of the statistical returns of the trade in relation to the quotations of exchange. In 1880-81 the exports first assumed commercial importance. Exchange was then from 1s [illegible] 8d, and freights from Calcutta were £2-12-6 to £3-2-6 a ton, with the English price 40—49s. a quarter. Since then the trade has manifested the most violent fluctuations, due mostly to influences of supply and demand outside India. Exchange was lower and freights were also lower in [illegible] than in 1886-87, yet the exports fell from 22 to 13 million cwt., and the reason was that in the latter year prices were low in Europe, and relatively [illegible] in India. It became more profitable to retain than to export wheat. [illegible] 1891-92 exchange was, if anything, still lower than in 1887-88, but prices were rising in Europe and it became profitable to export [illegible] made, and India exceeded its previous record by 8 million cwt. [illegible] to a fall in exchange with a rise of prices in Europe are [illegible] conditions that encourage the Indian export trade as [illegible] but the gain that results is a secondary, not primary, [illegible] preciation of silver. The late Sir J. Caird wrote [illegible] "The wheat trade of India is thus found to be [illegible] the prospects of a material diminution in the [illegible] rise in local prices relief is immediately afforded [illegible] tion in the country of wheat grown for export [illegible]

But enough may, perhaps, have been said [illegible] have been advanced on the subject of the effect [illegible] on the Indian wheat trade. It may suffice [illegible] final conclusion (a writer whose utterances [illegible] quoted above) on the main issues of [illegible] "Then is the Indian wheat-grower [illegible] of the rupee? That is by no [illegible] growers in other countries at a [illegible] the same price for his wheat as [illegible] what is conventionally [illegible] which would send it up [illegible] price of wheat up in Europe [illegible] the number of rupees [illegible] equal competition [illegible]

DEPRECIATION OF SILVER.

Gambling Trade. 525

[illegible]

DEPRECIATION OF SILVER.

on, he ruins wheat-growers elsewhere without, apparently, doing himself any good."

Mr. Bear then deals with the question whether there is not a limit to the quantity of the Indian wheats, such as now produced, which Europe will receive. "Indian wheat," he says, "certainly does not improve our bread, much as the bakers like flour made from it, because of the extra quantity of water which it will absorb, and if too much of it were used bread-eaters would rebel. This fact has been more patent than ever, since the finer qualities of Indian wheat have come in only very small quantities. Scarcely any No. 1 wheat of any kind has been imported of late, No. 2 Calcutta Club being about the standard quality of the great bulk of our supply. Moreover, the large buyers whom I have consulted, with only one exception, declare that the quality of the wheat sent here from India has, as a whole, deteriorated." But the explanation of this decline may be seen in the sentence or two which Mr. Bear devotes to the subject of the adulteration of Indian wheat. "But the great difficulty, he says, has been—and there is nothing to show that it has been removed—that buyers of Indian wheat in this country prefer cheap 'dirty' wheat to comparatively dear 'clean' wheat." As the trade is presently constituted and controlled, it may therefore be safely affirmed that the evil and the good, the profit and the loss, is far more intimately related to "refraction" than to depreciation. The governing factor of the trade is, however, the low price at which the Indian cultivator can profitably produce wheat. Mr. Bear says that America has admitted that she cannot grow wheat profitably below from 21 to 24*s.* a quarter, and that the Indian cultivator is satisfied with 15*s.* 6*d.* The reductions that have and are still being effected in transit charges have and in the future will still further bring the vast wheat resources of India into the field of European commerce. The supplies of our granaries are poured into the European markets during the very months when prices are ruling high. Let India but effect therefore the greatly needed reforms and try to improve not only the purity but the quality of her wheats, and she need then fear no competitor for the peculiar class of wheats which she can produce.

Adulteration. 808 *Conf. with pp. 110-116, 169-171.*

FOREIGN TRADE.

FOREIGN TRADE. 809

Foreign Trade.—In order to convey some idea of the present position and character of the Foreign wheat trade of India, the following table may be furnished. It need only be remarked that the last year there exhibited has been derived from the monthly returns, and as these are found at times not absolutely correct the annual statement of the trade (which has not as yet appeared) occasionally modifies the monthly reports. It is believed, however, that the figures given for 1891-92 will be found very nearly correct; they demonstrate the very significant expansion that has undoubtedly taken place. This has been admitted on all hands as being, to a very large extent, accidental. To have been due to the anticipated scarcity of wheat in Europe, owing to the serious loss of the Russian supply. Prices rose in Europe, while at the same time exchange was falling. These are the conditions that make exportation from India advantageous, but the rush made proved disastrous to many since the Russian supply was by no means so deficient as had been anticipated at the beginning of the season. That the expansion of 1892 has given some foretest of being, however, more than an accidental fluctuation, it may be added that the currently accepted view, among those best qualified to judge, is that the Indian exports will very possibly never again fall to so low a position as they occupied in 1890-91. The reports of the traffic, so far as can be ascertained for the year 1892-93, give tokens of a higher level even than those for 1891-92.

TRADE, FOREIGN.

TABLE I.

Chief Items of the Foreign Wheat and Flour Trade of India.

Year	WHEAT: I Exports, Indian produce		II Exports, Foreign produce		III Imports, Foreign produce		FLOUR: IV Exports, Indian produce		V Share of exports shown in column I taken by the United Kingdom		VI Share of exports shown in column I taken by Egypt and the Continent		VII Comparison of wheat with rice exports. *Total exports from India of rice to foreign countries*	
	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	No returns	No returns	[illegible]	[illegible]	898	3,103	17,317,285	4,49,91,615
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,197	5,073	23,291,950	3,76,10,301
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49,411	2,21,684	20,145,395	5,54,07,979
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	414,777	19,85,330	17,233,919	4,79,53,337
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	302,019	[illegible]	20,410,033	5,31,10,946
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	809,444	37,07,180	19,914,234	5,81,58,100
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19,488,39[illegible]	6,05,03,761
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21,437,233	8,97,37,210
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22,165,701	8,40,15,017
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27,200,040	9,05,71,528
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29,884,431	8,30,81,069
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31,159,194	8,47,83,172
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27,030,810	8,36,10,798
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28,011,533	7,10,21,376
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29,215,304	9,41,71,270
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	26,870,178	8,53,03,364
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29,316,037	9,19,16,862
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	23,144,041	7,01,53,087
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27,038,909	10,11,84,819
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24,007,341	12,87,77,195
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31,101,910	13,19,39,700

[illegible] consigned to Aden and Ceylon;

[illegible] the trade with Europe in the following years was mainly [illegible]

TRADE, FOREIGN.

The above table will be seen to manifest the total foreign traffic: the exports to foreign countries of Indian wheat, columun I.; the re-exports of foreign wheat, column II.; the imports of wheat from foreign countries, column III.; the exports of flour from India, column IV.; the share of the exports of Indian wheat taken by the United Kingdom, column V.; the share taken by Egypt and the Continent of Europe collectively, column VI.; and to allow of comparison with column I., the exports of rice from India, column VII. It will be still further seen that during the past twenty-one years the exports of Indian wheat to foreign countries have expanded from 637,099 cwt. valued at £235,644 (nominal sterling) in 1871-72 to 30,306,989 cwt. valued at £14,382,244 (nominal sterling) in 1891-92. The imports of Foreign wheat and the re-exports of a portion of these again shown in columns III. and II. are unimportant and may, therefore, be set aside from all further consideration. The traffic in flour is, however, significant, and may almost be regarded as giving a foretaste of the possible future influence of this new and prosperous industry. For, were it possible for India to send to Europe in large quantities a good flour, the appearance of such a rival might rouse the millers to exercise their influence with the shippers against some of the pernicious practices of the present wheat trade. In 1871-72 the exports of flour from India were 243,093 ℔ valued at £72,867 (nominal sterling), and last year they were 61,028,494 ℔ valued at £361,587 (nominal sterling). But what is more significant, the traffic has never, during all these years, manifested the slightest fluctuation. Year by year it has steadily and surely advanced; the exports last year were 14 million pounds in excess of the previous year, and 25 million pounds greater than five years ago. The exports to Europe have not as yet assumed alarming proportions, the bulk of the flour being consigned to Aden, Ceylon, Arabia, etc., but the share taken by Europe has been recorded in one year as considerably over 1 million pounds and this traffic seems capable of immense expansion.

TRAFFIC in FLOUR. 810

Indian Flour appreciated on the Continent of Europe. 811

NOT LIKED in SCOTLAND 812

Columns V. and VI. of the table manifest the shares taken by the United Kingdom and by the continent of Europe and Egypt. The average of the past ten years shows these two markets as of co-equal importance, the second being, if anything, slightly more valuable than the first. The Continental and Egyptian supply is, therefore, of great moment to India, since it very often represents the quantity, roughly speaking, of the Russian wheat liberated for England. The suitability of Indian wheat, for many purposes in the Continent of Europe, is as significant as is its want of favour with the bakers of Scotland. Its extreme dryness and ricey character commend it for many requirements, but these are the very features that render it unsuitable by itself in the Scotch baking system. To India, therefore, the Continental market has a stability about it that renders it in some respects more desirable than the English, where Indian wheat is used almost exclusively to correct the defects of other qualities and to meet deficiencies in supply.

REMOVAL of EXPORT DUTY. 813

Before passing to consider an analysis of the figures given in Table I., it may be added that Indian wheat was freed from an export duty on the 4th January 1873, while rice bears to the present day a duty of 15 per cent. on the value. In spite of this fact it will be seen that the exports of rice have manifested a remarkable progression from £4,499,161 (nominal sterling) in 1871-72 to £13,385,970 in 1891-92.

But in order to manifest more clearly the shares taken by the various Continental countries, of India's wheat, the following analysis may be furnished of the returns for the past eleven years:—

TRADE, FOREIGN.

TABLE II.

Analysis of the Exports of Wheat from India to Foreign Countries for the past eleven years; designed to show the share taken by the United Kingdom, Europe, Egypt and other Countries, as also the relative participation of the Indian Exporting Provinces.

	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
United Kingdom	9,370,430	6,571,160	10,858,210	7,444,081	12,071,318	9,667,501	6,030,708	9,037,830	7,686,115	8,208,935	12,345,453
Europe: Austria	48,121	8,000	800	1,022	3,010	2,750	1,970	5,541	...	4	
Belgium	4,015,437	1,438,808	2,303,577	1,734,684	2,601,593	3,403,785	596,088	2,477,730	2,329,510	1,920,138	4,654,949
Denmark	40,051		40,000	.	...	...		.		..	...
France	3,368,073	3,307,218	3,302,088	3,312,133	2,145,243	2,803,670	2,559,040	3,131,551	1,250,169	1,517,888	6,026,618
Germany	39,611	..	85,084	...	..	..			7,003	22,859	.
Greece		2,000	1,011	1,437		1,909	1,256	.	.	..	
Holland	211,100	371,240	104,750	131,005	81,018	206,945	60,591		250,684	8,000	523,036
Italy	310,318	170,003	443,333	700,849	1,218,269	5,212,308	3,073,704	1,125,058	403,246	439,685	1,062,125
Portugal		44,070	14,000	3,008	6,000	46,798	10,000	.	...	52,000	..
Spain		1,500	17,600	...	202,080	130,140	127,400		600	.	..
" (Gibraltar)	48,804	431,098	80,430	93,074	68,247	54,337	130,914	36,792	22,976	30,499	...
Malta	109,051	109,138	144,413	93,184	31,006	84,088	10,226			...	.
Total	8,448,708	6,472,814	6,630,503	6,078,004	6,526,468	11,946,823	6,571,250	6,776,672	4,264,188	3,991,073	12,266,725
Egypt	910,000	700,330	3,303,000	2,150,430	2,200,151	1,317,654	659,803	1,658,247	1,654,166	2,000,218	4,559,956
Other Countries	318,480	608,811	201,190	137,430	160,000	648,900	207,399	397,089	194,755	120,270	834,852
GRAND TOTAL	[illegible]	14,144,407	20,020,435	15,811,754	21,066,810	22,203,420	13,518,160	17,610,081	13,790,224	14,320,406	30,306,989
Bengal	[illegible]	4,410,407	7,611,811	2,870,064	4,180,052	7,037,057	4,334,708	2,950,985	1,550,839	1,340,355	4,746,035
Bombay	[illegible]	6,005,944	8,070,001	8,098,108	10,188,880	12,566,144	8,541,021	10,654,163	5,140,881	6,212,143	14,430,868
Sind	[illegible]	3,714,473	4,372,850	4,821,886	6,241,017	2,613,748	600,758	4,004,030	7,100,282	6,767,300	11,125,504
Madras	[illegible]	8,000	1,233	1,411	1,552	998	1,005	894	1,222	698	979
Burma	[illegible]	8,370		8,407	16,578	4,473	17				
Total	[illegible]	14,144,407	20,020,435	15,811,754	21,066,810	22,203,420	13,518,160	17,610,081	13,790,224	14,320,496	30,306,989

Foreign Trade in Indian Wheat.

TRADE, FOREIGN.

The above table speaks so forcibly that comment seems scarcely necessary. The imports of Indian wheat obtained by the United Kingdom have fluctuated between 6 million and 12 million cwt. Up till recently that share of the trade represented fully one half the total, but last year the demands of the Continent of Europe were nearly as great as those of the United Kingdom, and, with the Egyptian supply, came to 17 million cwt. It has already been stated that it is necessary to view the Egyptian traffic in Indian wheat along with the European, since a large share of the Egyptian is destined ultimately for Europe. Next to England, France is the most important consuming country for Indian wheat, and last year's supply (6 million cwt.) was the highest recorded quantity taken by that country. Some five years ago, Italy took over 5 million cwt. of Indian wheat, but during the subsequent years the demands shrank considerably, though it seems possible a very large share of the Egyptian re-exports of Indian wheat go to Italy. By the returns of the past eleven years' trade, however, Belgium is seen to hold the third place in importance, the order being the United Kingdom, France, Belgium, Egypt, Italy.

Provincial shares.
814

Share taken by Indian Ports.—Turning now to the value of the Indian ports in the export traffic in wheat, the order of importance is Bombay, Karachi (Sind), Calcutta (Bengal), with Madras and Burma, taking very poor fourth and fifth places. It may be said that, with the prosperity of Karachi, the trade from Calcutta has declined, though it seems probable that the Bengal-Nagpur Railway may drain towards Calcutta large supplies that were either not exported from India at all or which formerly percolated towards Bombay. The competition of the Midland Railway system has undoubtedly diverted towards Bombay, and to some extent towards Karachi as well, a large quantity of the wheat that used to find its way to Calcutta. At the ports on the western side of India the charges borne by the grain are much lighter than at Calcutta. But it may be explained that the writer has been unable to see returns of the recently opened out Railway systems that bear on the wheat trade. He, therefore, only assumes that the improvement in the exports of 1891-92 from Bengal may, in some measure, be due to the Bengal-Nagpur Railway, but there would seem no doubt that the improved and cheapened railway communication with Bombay and Karachi largely accounts for the immense expansion of the trade that has taken place from these ports. It seems probable also that the lower rate of refraction that now prevails in Bombay, and the efforts that have been made to classify the wheat, have begun to tell materially in favour of that port. The chief cause, however, of the immense expansion of the total exports from India has primarily to be attributed to the rise in price that, for some time past, has ruled in Europe. But had the facilities of the trade effected in India not taken place and did India not in itself possess vast resources, the sudden expansion witnessed in 1891-92 would have been an impossibility.

Lower Refraction and Classification of wheat.
815

TRANS-FRONTIER.
816

Trans-frontier Trade.—Before turning from the subject of the Indian Foreign Trade to that of the Local Traffic and Consumption, it may be desirable to give here a few brief facts regarding the transfrontier land trade. For this purpose it does not seem necessary to do more than furnish a statistical statement of the transactions during the past three years. The imports shown in the table below from Khelat, Kandahar, Khorasan, and as carried by the Sind-Pishin Railway, are obtained by the province of Sind. The other imports are into the Panjáb and the North-West Provinces. The amounts furnished by Nepal will be seen to be under one-half, but considerably more than one-third the total supply. Of the exports by far the larger proportion goes from the Panjáb and mainly to Kashmír.

TRADE: TRANS-FRONTIER.

TABLE No. III.

Indian Trans-frontier Land Trade in Wheat.

	Imported from						Exported to					
	1888-89.		1889-90.		1890-91.		1888-89		1889-90.		1890-91.	
	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R	Cwt.	R
Khelat	7,006	27,241	2,780	10,423	3,043	10,285	53	213	119	431	22	75
Kandahar	37	137	...	...	...	...	...	...	...	...	...	...
Khorasan	44	195	...	...	...	...	...	...	...	...	...	...
Sewestan	1,748	7,230	2,441	7,728	2,020	6,558	13,003	46,977	14,443	41,839	8,316	24,911
Tirah	816	3,573	281	748	998	2,848	886	3,278	837	2,308	939	2,586
Kabul	8,270	33,258	7,289	19,333	5,740	16,230	1,028	4,060	2,217	5,966	504	1,374
Bajaur	1,842	6,742	6,961	18,577	7,472	20,344	...	...	...	...	...	...
Kashmir	7,844	25,552	4,280	10,195	8,517	24,074	52,574	1,48,594	38,054	98,193	36,297	1,06,240
Nepal	37,512	1,11,105	15,550	50,389	28,655	1,01,291	1,919	6,519	2,092	7,411	720	2,572
Bhutan	47	157	...	...	40	144	...	...	...	...	...	...
Lus Bela	...	...	...	...	...	...	51	209	1,438	5,675	458	1,879
Ladakh	...	...	...	...	...	...	306	916	463	1,258	279	570
Thibet	...	...	...	...	...	...	...	...	...	...	...	...
Manipur	...	...	...	...	...	...	...	...	1	4	...	...
Karennee	...	...	...	...	...	...	22	210	...	...	...	...
Sind-Pishin Railway	5,367	24,978	14,658	63,787	9,481	41,764	38,027	1,66,013	2,539	10,945	15,031	67,096
TOTAL	70,533	2,40,168	54,240	1,81,180	65,966	2,23,538	111,122	3,91,562	64,311	1,84,310	64,249	2,15,706

TRADE: INTERNAL.

An inspection of the above table will reveal the fact that the imports are, as a rule, balanced by the exports, so that to the country at large the traffic possesses little interest, as it neither adds to, nor removes from, the annual supply of the grain. The two chief items of the trade may be said to be the market offered for a fairly considerable amount of Panjáb wheat in Kashmír and in other countries across the North-Western Frontier of India, and the very large amount of wheat annually furnished by Nepal to the North-West Provinces. The comparatively smaller traffic across the Sind frontier usually shows a very small net export from that province.

817

INTERNAL TRADE.

Internal Trade in Wheat.—The necessary statistical information is not forthcoming to allow of a satisfactory treatment of this branch of the trade. Of the vast population of India only a very small proportion ever eat wheat in any form. This feature of the subject has already been fully dealt with in other chapters of this article, so that it may suffice to remind the reader of the fact without repeating statistical information in support of it. The returns of the internal trade most fully corroborate this view however, and it becomes expedient to endeavour to bring before the reader some of the leading indications of the internal consumption of wheat as derivable from the returns of Coasting Trade, and of the traffic recorded as conveyed along the Roads, Railways, and Rivers. The movement of wheat is mainly, indeed almost entirely, towards the port towns of Bombay, Karachi, and Calcutta. The amounts recorded as imported by these towns, very nearly corresponds, however, to the quantity shown as exported from each, to foreign countries. The small balance of imports (by land routes and coastwise) over exports (by sea) to foreign countries may therefore be accepted as roughly speaking representing the local consumption of wheat in the port towns. The movement from province to province, or from the provinces to the large inland towns, is remarkably small indeed—a fact which conclusively demonstrates that, except in the provinces of production, wheat may with safety be said to be scarcely if at all consumed in India.

COASTWISE. 818

Coastwise Trade.—The small consumption of wheat in the provinces of India generally is significantly shown by the coastwise transactions. The table No. IV. exhibits the total coastwise wheat trade during the past fifteen years. The one instructive feature is that by far the most important receiving province is Bombay; the interchange between the other provinces is quite unimportant. The supply drawn coastwise by Bombay is, however, intended to in part meet the foreign exports, so that the wheat shown in the returns can scarcely be regarded as consumed locally. With that exception the transactions (imports and exports) may be viewed as meeting local markets, but it is possible that the total trade for all India, shown by these routes, rarely exceeds 200,000 cwt., after the necessary correction has been made for the overlapping of returns and unavoidable duplication—due to the exports of one province appearing again as the imports of another. So far, then, the coastwise sea-borne trade by no means manifests a vigorous demand for wheat by the people of India. On a further page (198) particulars are given of the probable consumption of wheat. For an average year the total consumption of all India does not exceed six million tons, and if to that figure be added the foreign exports the result may be accepted as showing the total production. But it is in Northern India mainly that wheat is consumed, so that the provinces, such as Bengal, Madras, and Bombay, that possess a sea-board, would natually be expected to manifest a very small interchange in this commodity.

TRADE: COASTING.

TABLE No. IV.

Coastwise Indian Wheat Trade.

	Imports Coastwise						Exports Coastwise					
	Into Bengal.	Into Bombay.	Into Sind	Into Madras.	Into Burma	Total.	From Bengal.	From Bombay.	From Sind.	From Madras	From Burma.	Total.
	Cwt.	Cwt	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
1876-77 . . .	4,496	10,801	4,535	123,244	9,986	153,063	93,733	106,413	40,566	26,755	11,440	277,907
1877-78 . . .	4,463	172,009	4,419	206,017	17,245	404,156	207,073	382,911	251,459	18,340	13,461	873,244
1878-79 . . .	748	156,367	2,840	112,030	12,517	293,504	132,073	310,267	21,112	5,380	9,672	478,504
1879-80 . . .	1,647	128,953	3,455	83,117	29,008	257,292	110,334	224,390	21,911	11,481	2,126	370,302
1880-81 . . .	3,320	170,975	54,960	61,798	16,366	307,422	47,552	240,258	926	11,117	793	300,646
1881-82 . . .	9,675	242,607	67,318	38,402	8,709	366,711	20,830	275,823	833	14,739	2,010	314,256
1882-83 . . .	22,165	360,114	1,008	42,883	3,745	429,920	13,850	430,201	61,207	14,810	17,754	537,823
1883-84 . . .	4,022	311,024	669	34,019	10,530	360,264	16,930	172,203	218,208	2,033	1,424	420,788
1884-85 . . .	10,841	95,077	7,037	54,605	5,296	172,856	12,970	160,473	41,403	22,925	12,318	250,100
1885-86 . . .	4,560	200,768	3,106	45,600	4,625	258,959	12,281	316,619	5,973	9,186	3,984	348,043
1886-87 . . .	8,064	366,665	24,658	32,578	8,045	440,590	54,456	334,008	7,033	1,956	3,652	401,115
1887-88 . . .	4,377	137,064	2,094	32,413	26,585	202,663	36,547	193,583	26,550	2,808	1,778	261,266
1888-89 . . .	6,553	384,252	169	37,346	33,833	468,993	65,435	109,399	59,844	3,454	555	329,697
1889-90 . . .	3,395	338,494	260	33,401	41,918	431,569	57,742	131,393	94,701	1,827	356	286,059
1890-91 . . .	1,411	801,813	859	38,694	50,596	893,548	48,213	114,587	382,553	1,646	22	547,020

TRITICUM sativum.

Indian Wheat Coasting Trade

TRADE: COASTING.

The observation (deducible from the above table) may doubtless have been made by the reader, that the imports of the provinces of India, for some years past, have been in excess of the exports, whereas formerly the exports were in excess of the imports. The absence of a balance between imports and exports is customary in most returns of coasting trade and is due to many considerations. A large number of ships are often at sea, the cargoes of which have been recorded as exports, but not having been delivered when the year closed, they do not appear as imports and thus upset the relation of the record of imports and exports by being carried into another year. So, again (and this is particularly applicable to wheat), a province may have extensive transactions within its own ports, but little or none to external provinces. Thus, for example, the bulk of the Bombay imports coastwise are drawn from Sind and Goa—provinces which largely export, but practically import no wheat. Were Goa to receive a separate place in the coasting returns (similar to what is given to Sind, Bengal, etc., etc.), the balance sheet of the trade would come out more nearly correct; but, like the Native States, it is not so treated, and the result follows that its trade appears but on one side of the total account of the Indian transactions, *viz.*, as imports by Bombay, not as exports from Goa. The fact that the total coastwise exports of the provinces of India are not balanced by their imports, is a matter of less importance than the evidence which the figures afford of the comparative insignificance of the local trade in wheat, which the provincial exchanges demonstrate. Thus Bengal, in only one year (1882-83) during the past fifteen, has had a net import. Its average coastwise net exports for the five years, ending March 1891, were 47,326 cwt. The exports of Bengal go mainly to Burma, and the above average for the past five years provides for the corresponding average net import by Burma, which will be found to be 35,882 cwt. In only two years has Burma exported wheat in excess of its imports, *viz.*, in 1882-83 and in 1884-85. The production of wheat in Burma proper is very small indeed, and the Lower Province at least must be largely dependent on its coastwise supply of 35,882 cwt. Bengal, during the fifteen years dealt with in the above table, will be seen to have in only one year (1882-83) manifested a net import, so that from the coastwise trade returns we learn very little regarding local consumption. To obtain a knowledge of the Bengal consumption, reference must accordingly be made to the traffic by land routes. Madras, on the other hand, produces practically no wheat, and its supplies drawn by the railways amount on an average to about 100,000 cwt. from Bombay Presidency and to a smaller extent from the Nizam's Territory, so that if to that quantity be added the average net import (shown during the past five years) as carried coastwise, we learn that the consumption of wheat in Southern India does not on an average materially exceed 200,000 cwt. Its coastwise imports are obtained mainly from the northern ports of the Presidency, from Bombay port, and in a smaller degree from Bengal. Turning now to Bombay and Sind we learn that the former province has shown a net export as frequently as a net import (during the past fifteen years), but that for the latter half of that period, Bombay has manifested a distinct tendency to become an importing province, drawing its chief coastwise supplies from Sind and Goa. During the past three years (which consecutively have manifested an excess of imports over exports) the net import has averaged 357,659 cwt. Of that amount Goa in 1889-90 (for example) furnished 201,934 cwt. and Kattywar 14,651 cwt. The imports from Bengal and Madras may be said to be rendered of no moment, through the exports to these provinces balancing the record. The imports from Sind are, however, considerable; in 1889-90 they came

Margin notes: PROVINCIAL CONSUMPTION. 819 *Conf. with pp. 168, 197.* — In Bengal. 820 — In Burma. 821 — In South India. 822 — In Bombay. 823

to 59,347 cwt. But it need scarcely be said that these imports were to the port town of Bombay, and until evidence be obtained to the contrary it may safely be assumed the drain towards the Western capital has its existence in the foreign trade. During only three years of the fifteen here dealt with has Sind manifested a net import, *viz.*, 1880-81, 1881-82, and 1886-87. For the past four years the average net export has been 140,089 cwt, a quantity which will be found to have sufficed to meet the markets which Sind finds remunerative in Bombay port town, Cutch, and Kattywar. TRADE: COASTWISE. In Sind. 824

Having thus demonstrated the lessons that may be learned from the study of the coastwise trade with regard to the Indian traffic and consumption of wheat, attention may be turned to the records (such as they are) of the internal transactions carried by

Rail, Road, and River.—It is often very difficult, in dealing with Indian trade, to obtain returns for a particular year and framed uniformly on the same plan for each route along which goods are carried and distributed. This difficulty the writer has been in the habit of combating (throughout the compilation of this work) by furnishing particulars of more than one year, so that the reader may be enabled to form a conception of the bearings of each section of the trade, even although it may be impossible to furnish particulars of the last year in one section of the trade though possible in another. The Government of India experimentally issued in 1888-89 an imperial review of all Rail and River returns To construct a similar statement for 1891-92 would necessitate many weeks' labour, and the result when obtained might not even then be deemed very satisfactory. Even were the returns of rail and river accurately worked out, two important routes of transport would RAIL, ROAD, and RIVER. 825
Canal traffic. The regist
towns, and Native States,
(or say 21,334,087 cwt).
that furnished that amount
in the order of importance:—Bombay port town 1,53,64,191 maunds;

Nizam's Territory 14,658 maunds, Assam 5,650 maunds; and Berar 1,240 maunds So far then for the receipts of wheat, but to give full force to the interchange it becomes necessary to exhibit the producing prov-

with 1,00,1
59,91,357
Bengal wit
with 24,07
Central In
the Nizam
returned to
be left out
provinces,
mentioned.

TRITICUM sativum.

Provincial Wheat Trade.

LOCAL CONSUMPTION.

Central Provinces, the Panjab, Bombay, and the North-West Provinces, the local consumption of wheat is doubtless considerable, but the demand for the grain is exceptionally small in all non-producing provinces. It may, in fact, be said that wheat is the food of certain sections of the wealthy population, but except in the Panjáb it can hardly be classed as a staple article of human food in India. The remarkably low record of internal and coastwise traffic in the grain (when the transactions of the foreign trade are excluded from consideration) is, therefore, significant of the position wheat holds in India collectively. Contrast the facts furnished in this article, for example, with those of rice in another volume. It will (*Vol. V.*, *644*), for example, be found that the Indian consumption of rice must be annually close on 25½ million tons; that of wheat does not materially exceed six million tons. The average outturn for the four years ending 1888, on the ascertained average area of 26,508,000 acres, under the crop, is found to have been 7,225,500 tons, or between 6 and 7 maunds an acre. This would be a little over 31 million quarters, of 480 lb. But the foreign exports of these years showed an average of nine hundred thousand tons, so that the Indian consumption, for the years named, must have been annually close on 6 million tons, or say 27 million quarters. Expressed to the vast population of India this would represent but a nominal consumption—perhaps scarcely more than that of *one* of the numerous classes of grains known as millets (such as *juar*), but it has to be recollected that wheat consumption is very nearly confined to one or two regions. The Panjáb, for example, which has usually the largest area under wheat, exports comparatively the smallest amount, so that in the Panjáb wheat is an important article of diet. The Central Provinces, on the other hand, may with perfect safety be characterised as growing wheat almost exclusively for the export market (*Conf. with p. 197*). If, therefore, by a process of elimination the provinces that consume wheat be placed on one side, or if a figure be designed for each province to express the percentage which wheat plays to the total food of the people, there would remain by far the major portion of India for which no return could be furnished, and of which it will be correct to say that wheat is unknown as an article of diet (and scarcely as a luxury) to perhaps 95 per cent. of the population. These facts and statements explain, therefore, the remarkably small balance over foreign exports that, from the returns of rail, road, and river traffic, seems to be normally left in the non-wheat producing provinces and towns to meet local consumption. But to bring this brief review of the Indian wheat trade to a close, it does not seem necessary to do more than to furnish three tables of the internal trade: (1) one for Bombay in which the transactions with the port are isolated from those with the presidency; (2) a similar statement for Karachi; and (3) for Calcutta.

Outturn.
833
Conf. with p. 119.

TRADE of BOMBAY.

TABLE No. V.

Analysis of the Rail-borne Wheat Traffic of the Bombay Port Town and of the Bombay Presidency during the past three years.

Whence imported and whither exported	Imported into								Exported from							
	1889-90.				1890-91.				1889-90.				1890-91.			
	Port Town		Presidency		Port Town.		Presidency.		Port Town.		Presidency.		Port Town.		Presidency.	
	1 Mds.	2 R	3 Mds.	4 R	5 Mds.	6 R	7 Mds.	8 R	9 Mds.	10 R	11 Mds.	12 R	13 Mds.	14 R	15 Mds.	16 R
Provinces excluding Sea ports—																
Madras	.	.	561	2,244	.	..	...	...	8	28	93,784	3,28,344	..	.	65,488	2,08,743
Bombay	1,007,905	35,27,668	...	.	1,703,607	54,30,247	.	..	41,634	1,45,719			5,730	18,264		
Bengal	..	...	3	8	..	.	...	..	.	..	...	..		.	..	...
North-West Provinces and Oudh	648,725	17,02,903	7,612	19,982	216,558	5,95,552	805	2,214	...	...	3	7	8	25	15	48
Panjab	916,212	18,32,224	57,134	1,14,272	386,793	8,70,284	28,984	65,214	...	.	..	..	14	45	.	.
Central Provinces	4,430,927	1,05,83,452	16,766	39,819	5,897,023	1,32,68,302	25,253	56,819	2	7	372	1,302	5	16	1,251	3,988
Berar	342,178	8,55,445	93,022	2,32,555	291,108	7,45,964	34,883	89,386	.	..	33	115	...	...	49	156
Native States—																
Rajputana and Central India	991,939	34,71,786	148,511	5,19,789	760,165	24,23,026	94,624	3,01,614	8	28	34,800	1,21,800	191	609	14,841	47,308
Nizam's Territory	850	2,975	473	1,655	.		1,237	3,943	36	126	18,306	64,386		...	64,054	2,04,172
Mysore	.	...	1,084	3,794	225	717	326	1,039	38	133	87,667	3,06,834	3	9	89,697	2,85,909
Port Towns—																
Madras Ports	.	.	..	.	..	...			18	63	24,107	84,375	3	9	24,408	77,794
Bombay	..	...	41,634	1,43,719	..	..	4	16	...	.	1,007,905	35,37,665		...	1,703,607	54,30,247
Karachi	.	...	.	..	.	.	5,730	18,264	...	.	..					
Calcutta	21	55	.		1	3	..				.					
Total { Mds.	8,339,657	2,19,16,508	366,802	10,79,837	9,255,400	2,33,31,105	191,846	5,38,511	41,244	1,46,104	1,267,066	44,34,731	5,954	18,977	1,963,405	62,58,363
Total { Cwt.	5,956,183	.	262,001		6,611,064	.	137,033		29,817		905,047		4,253		1,402,434	.

If it be desired to arrive at the net imports (for example of Bombay port town in 1889-90) deduct the quantity at bottom of column 9 from that of column 1. If, on the other hand, it be desired to arrive at the net exports from the presidency in that year, deduct the total of column 3 from that in column 11. The table displays, at a glance, the sources from which Bombay draws its supplies.

TRITICUM sativum.

Rail-borne Wheat Trade of Sind.

RAIL-BORNE trade of SIND.

TABLE NO. VI.

Analysis of the Rail- and River-borne Wheat Traffic of Sind, and of its Port Town Karachi, during the past three years.

WHENCE IMPORTED AND WHITHER EXPORTED.	IMPORTS INTO								EXPORTS FROM							
	1889-90.				1890-91.				1889-90.				1890-91.			
	Karachi.		Sind.		Karachi.		Sind.		Karachi.		Sind.		Karachi.		Sind.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Mds.	R	Mds.	R	Mds.	R	Mds.	R	Mds.	R	Mds.	R	Mds	R	Mds.	R
British Provinces excluding chief Seaports—																
Sind . . .	25,37,122	72,94,226	...	...	24,43,967	74,81,587	...	...	3,535	10,163	...	...	4,418	13,530	...	...
North-West Provinces and Oudh . .	83	218	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Panjab . .	70,09,114	1,40,18,368	24,438	48,876	72,89,992	1,64,02,482	8,873	19,964	...	...	37	106	23	70	441	1,351
TOTAL .	95,46,389	2,13,12,812	24,438	48,876	97,32,959	2,38,84,069	8,873	19,964	3,535	10,163	37	106	4,441	13,600	441	1,351
Chief Seaports—																
Karachi . .	...	...	3,535	10,163	...	...	4,418	13,530	...	...	25,37,122	72,94,226	...	...	24,43,967	74,81,587
TOTAL .	95,46,389	2,13,12,812	27,973	59,039	97,32,959	2,38,84,069	13,291	33,494	3,535	10,163	25,37,159	72,94,332	4,441	13,600	244,3,408	74,82,938
Equivalent in cwt.	68,18,849	...	19,980	...	69,52,113	...	9,493	...	2,525	...	1,812,256	...	3,142	...	17,45,291	...

It will be seen from the above statement that the imports of wheat by Sind otherwise than those destined for Karachi, and that the exports from Sind otherwise than to Karachi, are unimportant in the extreme.

T. 833

RAIL BORNE Trade of CALCUTTA.

TABLE No. VII.

Analysis of the Rail- and River-borne Wheat Traffic of Calcutta during the past three years.

	Imports.			Exports.		
	1888-89.	1889-90.	1890-91.	1888-89.	1889-90.	1890-91.
By—	*Mds*	*Mds.*	*Mds.*	*Mds.*	*Mds.*	*Mds*
East Indian Railway.	43,37,729	30,55,746	25,96,286	2,392	533	642
Eastern Bengal Railway.	1,48,867	60,405	1,05,716	931	1,501	1,633
Boat . .	9,54,341	6,71,732	6,65,774	7,822	6,642	5,828
Road . .	2,178	1,084	.	56,743	74,706	1,01,910
Inland steamer	64,494	67,592	1,00,702	2,203	3,142	2,202
Sea. . .	11,298	543	1,157	40,91,631	21,88,740	18,88,622
TOTAL .	55,18,907	38,57,102	34,69,665	41,61,722	22,75,264	20,00,837
Equivalent in cwt.	... 3,942,076	.. 2,755,076	... 2,478,332	.. 2,972,659	.. 1,625,188	... 1,427,169

It has been thought unnecessary to prepare a detailed statement of the transactions with Bengal province alongside of that of Calcutta (similar to what has been furnished above for Bombay and Sind), but it may be naunds and The prov- mports and ovinces, and from and to Behar. An inspection of the registration of the Bengal rail traffic reveals the fact that other than with Behar and with Calcutta no part of the province participates in the wheat trade to external blocks. Even the traffic with internal blocks is very limited, so that *Bengal may safely be said to practically not consume wheat.*

SOURCES OF WHEAT Exported from CALCUTTA. 834

It need, therefore, be only necessary to furnish a statement of the Calcutta wheat supply in order to show the sources from which derived:—

	1888-89. Mds.	1889-90. Mds.	1890-91. Mds.
Behar	24,73,931	9,69,846	15,91,533
North-West Provinces and Oudh .	22,25,226	18,99,657	11,42,290
Bengal	6,94,095	4,95,291	4,84,798
Panjab	35,846	4,02,101	1,95,203
Central Provinces	76,739	67,421	53,236
Other places	13,070	2,786	2,603
TOTAL .	55,18,907	38,57,102	34,69,665

, comes Hurdoi, on the ulpore, n, etc. ollowing

CALCUTTA WHEAT. districts, for which the quantities furnished in the three last years may be given:—

	1888-89. Mds.	1889-90. Mds.	1890-91. Mds.
Nuddea	3,81,976	2,35,147	2,31,957
Hooghly	76,566	72,764	78,690
Moorshedabad	94,084	82,513	67,959
Other districts	1,41,469	1,04,867	1,06,195
TOTAL	6,94,095	4,95,291	4,84,798

(*J. Murray.*)

TRIUMFETTA, *Linn.; Gen. Pl., I., 234, 986.*

835 **Triumfetta annua,** *Linn.; Fl. Br. Ind., I., 396;* TILIACEÆ.

Syn.—T. POLYCARPA, *Wall.;* T. TRICHOCLADA, *Link.;* T. INDICA, *Lam.*

Vern.—*Aadai-otti,* TAM.; *Chikti,* HIND.

References.—*Atkinson, Him. Dist., 306; Gazetteer, Bombay, XV., 428.*

Habitat.—An herbaceous shrub, common in the Tropical Himálaya from Simla to Sikkim, the Khásia Mountains, Assam, the Konkan, Ava, and the Andaman Islands.

FOOD. Fruit. 836 Food.—It produces orange-coloured flowers, and fruit of the size of a large pea. Green paroquets feed on the ripe FRUIT or burr, hence, in Jamaica, the plant is known as Paroquet Burr.

837 **T. pilosa,** *Roth.; Fl. Br. Ind., I., 394.*

Syn.—T. PILOSA, *var.* β, *Thwaites;* T. TOMENTOSA, *Wall.;* T. GLANDULOSA, *Heyne;* T. POLYCARPA, *Wall.;* T. OBLONGATA, *Link.*

References.—*Dalz. & Gibs., Bomb. Fl., 25; Thwaites, En. Ceyl. Pl., 31; Atkinson, Him. Dist., 306; Gazetteers:—Bombay, XV., 428; N.-W. P., IV., lxix.*

Habitat.—Found throughout the tropical parts of India from the Himâlaya to Travancore and Ceylon.

FOOD. Fruit. 838 Food.—It produces yellow flowers and small FRUIT of the size of a cherry. The remark made of the fruit of the above is equally applicable to that of this species.

839 **T. rhomboidea,** *Jacq.; Fl. Br. Ind., I., 395; Wight, Ic., t. 320.*

Syn.—T. BARTRAMIA, *Roxb.;* T. TRILOCULARIS, *Roxb.;* T. ANGULATA, *Lam.;* T. ANGULATA & ACUMINATA, *Wall.;* T. VESTITA, *Wall.*

Vern.—*Chikti,* HIND.; *Bun-okra,* BENG.; *Aadai-otti,* TAM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 390, 391; Dalz. & Gibs., Bomb. Fl., 25; Thwaites, En. Ceyl. Pl., 31; Stewart, Pb. Pl., 28; Gamble, Man. Timb., 52; Atkinson, Him. Dist., 306; Dymock, Warden, & Hooper, Pharmacog. Ind., I., 238; Gazetteers:—Mysore & Coorg, I., 58; Bombay, XV., 428; N.-W. P., I., 79; IV., lxix.*

Habitat.—An herbaceous plant, met with throughout Tropical and Subtropical India and Ceylon, ascending to 4,000 feet in the Himálaya.

FIBRE. Plant. 840 Fibre.—The PLANT yields a soft glossy fibre, which is said to be considerably utilised in Madras.

MEDICINE. Fruit. 841 Medicine.—All the species belonging to this genus are mucilaginous, and are used as demulcents, but this is the one generally employed. The mucilage is said to make a serviceable injection for inveterate gonorrhœa. The burr-like FRUIT is believed in India to promote parturition. The members of this genus are the Lappuliers of the French colonies, and bear the significant names of *Herbe à cousin, peu de moine,* and *tête à nègre* (*Pharmacog. Ind.*).

FOOD. Plant. 842 Food.—In the Panjáb the PLANT is eaten as a pot-herb in times of scarcity (*Stewart*).

TRUFFLES.

Truffles, *Baillon, Traite de Bot. Med Cryptogam.*, 125. 843
References.—*Stewart, Pb. Pl.*, 268; *Baden Powell, Pb. Prod.*, 258, *Smith, Econ. Dict.*, 418.

. uber, which has given the name ... appreciated are T. cibarium, *Sibth.*; T. melanospermum, *Vittad.*; T. æstivum, *Vittad.*; T. magnatum, *Pico*; and T. mesentericum, *Vittad.*; natives of France and Italy. The

FOOD. 844
Kángra truffle as occasionally eaten by the Natives. It is brown or black inside, "highly flavoured and of excellent quality." It grows to a large size, a diameter of 4 inches being by no means uncommon, and is said to resemble the Piedmontese truffle (T. magnatum) in shape and flavour. It is probable that, though used by Europeans in cookery, it, like the English species of the same genus, is of inferior quality. It is said that the Natives discover its presence in the soil by smell.

TULIPA, *Linn.*; *Gen. Pl.*, *III*, 818.

Tulipa stellata, *Hook.*; *Linn. Soc. Jour.*, *XIV.*, 288; LILIACEÆ. 845
., PB.;

Athin-
, *Ind*,

Habitât.—Common in the Western Panjáb, the Salt Range, the Siwaliks and the outer Himálaya to Kumáon.

FOOD & FODDER. Bulbs. 846
Food & Fodder.—The BULBS are frequently eaten by Natives, and are sold for that purpose in some of the bazárs, *e g*, in Peshâwar. They are also eaten by animals.

Turmeric, see Curcuma longa, *Roxb.*; SCITAMINEÆ; Vol. II, 639.

Turnip, see Brassica campestris, *Linn.*; sub-species Rapa, Vol. I, 523.

Turpentine, see Pinus, Vol. VI, Pt. I., 238, and Pistacia, Vol. VI, Pt. I, 271.

TURPINIA, *Vent.*; *Gen. Pl.*, *I.*, 413, 999.

Turpinia pomifera, *DC.*; *Fl. Br. Ind.*, *I*, 698; *Wight, Ic.*, *t.* [972; SAPINDACEÆ. 847

Syn.—DALRYMPELIA POMIFERA, *Roxb.*; T. NEPALENSIS, *Wall.*; T. MICROCARPA, *W. & A.*; T. MARTABANICA & LATIFOLIA, *Wall.*; CANARIUM SAJIGA, *Ham.*

Vern.—*Thali, nagpat*, NEPAL; *Janki-jám*, SYLHET; *Márgut, singnok*, LEPCHA; *Bundibru*, MECHI; *Nila*, NILGHIRIS; *Taukshama, daukyama*, BURM.

References.—*Roxb., Fl. Ind., Ed. C B.C.*, 213; *Thwaites, En. Cyl. Pl.*, 71, *Kurz, For. Fl. Burm*, *I.*, 292; *Gamble, Man. Timb*, 102; *Beddome, Fl. Sylv.*, *t.* 159, *Gazetteer, Mysore & Coorg, I.*, 53; *Ind. Forester, II.*, 22, *IV.*, 241; *Jour. Agri.-Horti. Soc, Ind.* (*New Series*), *V.*, *Pro.* (1875), 23.

Habitat.—A moderate-sized deciduous tree, found in the Eastern Sub-tropical Himálaya from Nepál to Sikkim, at altitudes of 2,000 to 7,000 feet, also in the Khásia mountains, Assam, Sylhet, Cachar, Chittagong, Burma, and Penang, and in the Western Peninsula from the Konkan southwards.

FOOD & FODDER. Fruit. 848 Leaves. 849 Food & Fodder.—The FRUIT is edible, and the LEAVES given as fodder.

TIMBER. 850 Structure of the Wood.—Grey or pale-brown, soft, fibrous but close-grained, soon attacked by insects; weight 30lb per cubic foot. It is not used.

Turquoise, *Man. Geol. Ind., Vol. III, 435.*

Occurrence. 851 Occurrence.—The existence of the true turquoise in India is doubtful. From the presence of blue streaks in the copper ores of Ajmir, Mr. Prinsep suggested the possibility of the stone being found there. Subsequently Dr. Irvine reported its existence in these measures, but, according to Ball, the so-called turquoises of Ajmir are only blue copper ore. The principal turquoise mines in the world are at Ansar, near Nishapur, in Khorasan, Persia.

The turquoise is largely used by the Natives of India in jewelery but imitations are perhaps more generally employed than the true stone. *Conf. with* Carnelian, Vol. II.

TUSSILAGO, *Linn.; Gen. Pl., II., 438.*

852 **Tussilago Farfara,** *Linn.; Fl. Br. Ind., III., 330;* COMPOSITÆ.

Vern.—*Wátpan,* PB.

References.—*Stewart, Pb. Pl., 131; Year-Book Pharm., 1874, 626; Smith, Econ. Dict., 128; Agri.-Horti. Soc., Ind., Jour. XIV., 26, 55.*

Habitat.—A white, wooly herb, found in the Western Himálaya, from Kashmír to Kumáon at altitudes of 6,000 to 11,000 feet; distributed to North and West Asia, North Africa, and Europe.

MEDICINE. Plant. 853 Leaves. 854 Medicine.—The PLANT is bitter and astringent, and contains a large quantity of mucilage. The LEAVES are sometimes used as a dressing for wounds in the Panjáb (*Stewart*); in Europe they are smoked like tobacco as a domestic remedy for asthma.

TYLOPHORA, *Br.; Gen. Pl., II., 770.*

855 **Tylophora asthmatica,** *W. & A.; Fl. Br. Ind., IV., 44; Wight, Ic., t. 1277;* ASCLEPIADEÆ.

Syn.—T. PUBESCENS, *Wall.;* T. VOMITORIA, *Voigt;* ASCLEPIAS ASTHMATICA, *Willd.;* A. TUNICATA, *Hort. Calc.;* A. VOMITORIA, *Kœn.;* CYNANCHUM VOMITORIUM, *Lam.;* C. VIRIDIFLORUM, *Sims.;* C. FLAVUM & BRACTEATUM, *Thunb.; Thwaites;* C. IPECACUANHA, *Willd.;* C., INDICUM, *Herb. Burm.*

Vern.—*Jangli-pikván, antamúl,* HIND.; *Anto-mul,* BENG.; *Mendi,* URIYA; *Pitmári, kharaki-rásna, anthamul,* BOMB.; *Pitakári,* MAR.; *Pit-kári,* DEC.; *Nach-churuppán, nanja-murich-chán, náy-pálai, péyp pálai,* TAM.; *Verri-pála, kukka-pála, káka pála,* TEL.; *Valli-pála,* MALAY.; *Bin-nuga,* SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 252; Voigt, Hort. Sub. Cal., 539; Thwaites, En. Ceyl. Pl., 197; (Excl. var. β); Dalz. & Gibs., Bomb. Fl., 150; Mason, Burma & Its People, 479, 801; Sir W. Elliot, Fl. Andhr., 77, 102, 191; Pharm. Ind., 142, 458; Ainslie, Mat. Ind., II., 83; O'Shaughnessy, Beng. Dispens., 451, 455; Moodeen Sheriff, Supp. Pharm. Ind., 249; Dymock, Mat. Med. W. Ind., 2nd Ed., 519; Fleming, Med. Pl. & Drugs, as in As. Res., Vol. XI., 158; Flück. & Hanb., Pharmacog., 427; Bent. & Trim., Med. Pl., t. 177; Official Corresp. on Proposed New Pharm. Ind., 284; Drury, U. Pl., 434; Lisboa, U. Pl. Bomb., 256; Bidie, Prod. S. Ind., 12; Gazetteers:—Mysore & Coorg, I., 62; Bombay, XV., 438; Hunter, Orissa, II., 181; Gribble, Man., Cuddapah, 200.*

Habitat.—Met with in N. and E. Bengal, Assam, Kachar, Chittagong, Deccan Peninsula, Burma to Malacca; common in Ceylon.

MEDICINE Plant, 856

Medicine.—The medicinal properties of this PLANT appear to have been long known to the Natives of those localities in which it occurs. It is, however, not mentioned in any of the ancient standard Sanskrit and Muhammadan works on Materia Medica, and was first brought to the notice of Europeans by Roxburgh, who writes as follows:—"On the coast of Coromandel, the ROOTS of this plant have often been used as a substitute for Ipecacuanha. I have often prescribed it myself, and always found it answer as well as I could expect Ipecacuanha to do. I have also often had very favourable reports of its effects from others. It was a very useful medicine with our Europeans who were unfortunately prisoners with Hydar Ally during the ... tunately prisoners pretty large ... and 1783. In a ... doses, often re- ... practice in the General Hospital at Madras in 1776, 1777, and 1778, ... down many observations of its uses when in but lost them, with all my other papers, by the storm and ... at and near Coringa in May 1787. I cann... ie virtues of this valuabl... I ... r (... Anderson) that he had many years before known it used, both by ... informed by the Physician ... the time ... little the European and Native Troops, with great success in the dysentery which happened at that time to be epidemic in the camp. The store of Ipecacuanha had, it seems, been wholly expended, and Dr. Anderson, finding the practice of the black doctors much more successful than his own, acknowledged, with his usual candour, that he was not ashamed to take instruction from them, which he pursued with good success; and collecting a quantity of the plant which they pointed out to him, he sent a large package of the roots to Madras. It is certainly an article of the Hindu Materia Medica highly deserving attention."

Roots. 857

Ainslie adds his testimony to the value of the drug, and remarks that the Vytians prize it for its expectorant and diaphoretic properties, and often prescribe it in an infusion to the quantity of half a tea-cupful, "for the purpose of vomiting children who suffer much from phlegm." Fleming repeats Dr. Russell's note on the opinion of the Physician General of Madras, and strongly recommends extended trial of the drug. Later, Sir W. O'Shaughnessy records his opinion that the emetic properties of the root are well established, but that it requires to be given in double the dose of the true Ipecacuanha, for which it affords an excellent substitute.

Owing to this concensus of opinion in its favour it was admitted as officinal in the *Bengal Pharmacopœia* of 1844. On the compilation of the *Pharmacopœia of India* in 1868, the opinions of the above writers were confirmed by numerous reports to the Committee who superintended the preparation of that work. The root was, however, superseded by the dried LEAVES which were found to be more uniform and certain in their action, and were therefore made the official part of the plant. They are described as one of the best indigenous substitutes for Ipecacuanha. Their actions are emetic, diaphoretic and expectorant; they are recommended as useful in all cases indicating the necessity of emesis, and as a remedy for dysentery, catarrh and other affections in which Ipecacuanha is generally employed. The dose as an emetic is from 25 to 30 grains of the dried leaves powdered, as a diaphoretic and expectorant from 3 to 5 grains thrice daily or oftener. Moodeen Sheriff, in the long and interesting note given below, inclines to the opinion that the other

Leaves. 858

writers were right in preferring the root to the leaves, but that both are inferior to certain other indigenous substitutes for Ipecacuanha.

CHEMISTRY. 859 CHEMICAL COMPOSITION.—A concentrated infusion of the leaves has a slightly acrid taste. It is abundantly precipitated by tannic acid, by neutral acetate of lead or caustic potash, and is turned greenish-black by perchloride of iron. Broughton of Ootacamund obtained from a large quantity of leaves a small amount of crystals—insufficient for analysis. Dissolved and injected into a small dog they occasioned purging and vomiting (*Pharmacographia*).

SPECIAL OPINIONS.—§ "Tylophora asthmatica is one of the commonest plants in the fields and low and sandy jungles in Southern India. No part of this plant is sold in the bazár, but it can be very easily obtained in any quantity at the cost of collection. I have frequently used it during the last 16 or 17 years, and found every part of it, including the follicles, to possess the emetic property; but the roots and leaves are by far the best. Of the two latter, again, the roots are not only superior in their action to the leaves, but also much more easily reduced to a fine powder. The roots of T. asthmatica are involved in the greatest confusion as to their physical characters, and I shall, therefore, describe them here before speaking further of their medicinal properties. The root of this plant consists of many thin fibres or fibrils attached to a small woody portion, which is the axis or centre between them and the stem. The number of fibrils in each root is very variable, generally from 5 to 20, and sometimes upwards of 50. They are from 2 to 6 inches long, about a line in thickness, and of a pale or dirty white colour. They are seldom branched, but generally give attachment to very thin and hair-like fibres or rootlet. Their taste is slightly nauseous, but without the least bitterness. The roots of T. asthmatica in my collection of drugs at Calcutta have been gathered by myself with a view to avoid every doubt as to their genuineness. They correspond exactly with the above description. It is a matter of surprise that a doubt should exist in the description of the root of a plant which is found everywhere in this country and can be examined at any moment, if necessary. At one time I thought that T. asthmatica was the best substitute for Ipecacuanha in India, but from subsequent and more extensive experience of Native drugs I find that it is not the best, but one of the four or five best substitutes and ranks after Randia dumetorum, Strychnos potatorum, and Luffa amara. Dose:—Of the root and leaves, as an emetic, from 40 to 50 grains; and as a nauseant and expectorant, from 4 to 10 grains. Dose:—Of the root, as a remedy in dysentery, from 15 to 30 grains or more" (*Honorary Surgeon Moodeen Sheriff, Khan Bahadur, Triplicane, Madras*). "A liniment prepared with the root is applied to the head in cephalalgia and neuralgia" (*Native Surgeon T. Ruthnam Moodelliar, Chingleput, Madras Presidency*). "Still used as one of our indigenous medicines" (*Surgeon-General W. R. Cornish, F.R.C.S., C.I.E., Madras*). "Diaphoretic and expectorant in doses of 10 and 15 grains, and emetic in 30-gr. doses; used in diarrhœa and dysentery and often employed as a substitute for Ipecac" (*Surgeon-Major A. F. Dobson, M.B., Bangalore*).

860 **Tylophora fasciculata**, *Ham.; Fl. Br. Ind., IV., 40; Wight, Ic., t. 848.*

Vern.—*Bhui-dari*, BOMB.

References.—*Dalz. & Gibs., Bomb. Fl., 151; Dymock, Mat. Med. W. Ind. 2nd Ed., 521; Lisboa, U. Pl. Bomb., 267.*

Habitat.—Found in South Nepál and the South Konkan.

MEDICINE. Plant. 861 Medicine.—Dymock informs us that the PLANT is used in the Southern Konkan as a poison for rats and other vermin, and that Dr. Lyons records a case in which it proved fatal to man. He suggests that, since

it possesses very active properties, its physiological effects should be investigated.

Tylophora mollissima, *Wight; Fl. Br. Ind., IV., 43; Wight, Ic., t. 1275.* 862

ins.

Food.—This HERB is always more or less eaten in the Kaladgi District, and was especially utilised during the Deccan Famine of 1877-78 (*Dymock*). FOOD. Herb. 863

TYPHA, *Linn.; Gen Pl., III., 955.* [TYPHACEÆ. 864

Typha angustifolia, *Linn.; Roxb., Fl. Ind., Ed. C.B.C., 648;*

THE REED MACE, LESSER CAT'S TAIL, or ELEPHANT GRASS.

Syn.—T. ELEPHANTINA, *Roxb.*

Vern.—*Pater,* HIND., *Hogla,* BENG., *Bora,* KUMAON; *Kúndar, dib, dabpits, yira, boj, lúkh, patira, gond, pan, bori,* PB., *Pits, yira,* KASHMIR; *Pun,* pollen=*búr, búri,* SIND, *Rámbana,* MAR; *Ghabajarin,* GUZ.; *Rámabana, ramban,* BOMB.; *Jammu gaddi, emiga-junum,* TEL.;

Habitat.—A rush found on margins of tanks and rivers throughout India

Fibre.—The fibrous STEMS and LEAVES are used for many purposes

Food & Fodder.—The young SHOOTS are ... paragus (*Baden Powell*). The ROOTS are ... the pollen is largely employed as flour and ... It was eaten in Bombay during the ... favourite fodder for elephants.

Domestic, etc.—The long, tortuous, ... to some depth, and are very valuable ... a river as the Indus. The lower ... have the property of speedily and ... dried stalks are used for making ... of the ripe fruit is mixed with ...

spores of Lycopodium, is inflammable, and is employed in Europe as a substitute for that substance.

875 **Typha latifolia**, *Willd.; Stewart, Pb. Pl.*, 246.

THE GREATER CAT'S TAIL.

Vern.—*Patera*, BIJNOR; *Kanda-tella*, GARHWAL; *Pia, yira*, KASH. *Boj, lúkh, dile, kúndar, patira, gond*, PB.; *Mudo-pun*, SIND; *Jungl, bájri*, BOMB.

References.—*Dymock, Mat. Med, W. Ind., 2nd Ed., 891; Murray, Pl. & Drugs, Sind, 17; Atkinson, Him. Dist., 318.*

Habitat.—Common in similar situations as the preceding, in the Panjáb, Sind, the Deccan, and probably also Kutch.

FIBRE. Leaves. 876 Fibre.—Stewart describes this as employed similarly in every way to T. angustifolia in the Panjáb. Atkinson states that the LEAVES are largely used in Kumáon, in the manufacture of a coarse matting called *boriya*, of which some 900 maunds are annually exported from the district.

FOOD. Root. 877 Seeds. 878 Food.—The ROOT is eaten in Kashmír; in the Deccan the SEEDS are used as an article of food during famine seasons.

DOMESTIC. Stem. 879 Domestic.—The succulent lower portion of the STEM is said to have the same property of clearing turbid water, as is ascribed to the preceding species.

TYPHONIUM, *Schott.; Gen. Pl., III., 967.* [611,

880 **Typhonium bulbiferum**, *Dalz.; DC., Monograph. Phanerog., II.*

FOOD. Bulbs. 881 Leaves. 882 Reference.—*Lisboa, U. Pl. Bomb., 183 207.*

Habitat.—Found in Malabar and the Konkan.

Food.—The BULBS and LEAVES are eaten boiled.

[*Wight, Ic., t. 801.*

883 **T. trilobatum**, *Schott.; DC., Monograph. Phanerog., II., 614;*

Syn.—ARUM TRILOBATUM, *Linn.;* A. ORIXENSE, *Roxb.;* TYPHONIUM ORIXENSE, *Schott.;* T. ROXBURGHII, *Saunders.* Brown in *Linn. Soc. Jour., XVIII., 261, adds syn.* T. TRISTE, *Griff.*, and reduces to this species T. SIAMENSE, *Zeigler.*

Vern.—*Ghét-kochu*, BENG.; *Karunaik-kizhangu, kár-karunaik-kizhangu*, TAM.; *Kanda-gadda, durada-kanda-gadda*, TEL.; *Chéna*, MALAY.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 627; Pharm. Ind., 250; Thwaites, En. Ceyl. Pl., 335; Moodeen Sheriff, Sup. Pharm. Ind., 249.*

Habitat.—Met with in the Indian Peninsula, Ceylon, and Cochin China.

MEDICINE. Roots. 884 Medicine.—Roxburgh writes, "The ROOTS (when fresh) are exceedingly acrid. The natives apply them in cataplasms, to discuss or bring forward schirrus tumours. They also apply them externally to the bite of venomous snakes, at the same time giving inwardly about the size of a field bean. It is certainly a most powerful stimulant, in proper hands it might no doubt be used to great advantage in the cure of several disorders." Roxburgh appears, however, to have overestimated its value, since the Editor of the *Pharmacopœia of India*, while including the plant in the secondary list, remarks that any good effect which could b[illegible] from it might be more readily obtained from a mustard poulti[illegible] acrid principle," he writes, "is very volatile, and by the ap[illegible] heat, or by simple drying, the roots become innocuous or even [illegible] as articles of diet."

SPECIAL OPINIONS.—§ "Is an article of food, it relaxes [illegible] thereby relieves hæmorrhoids. The wild plant is used as [illegible] piles" (*Native Surgeon T. R. Moodelliar, Chinglepu[illegible]*) [illegible] formed into paste are used as an external applicatio[illegible] bees, wasps, scorpions" (*Civil Surgeon J. H. T[illegible] Monghyr*).

ULMUS, *Linn; Gen. Pl., III., 351.* 1

A genus of deciduous trees, which comprises about sixteen species; natives of North Temperate regions. **U. campestris,** *Linn.*, the European Elm, is said by **Brandis** to occur as a small shrub along river beds, and as a middle-sized tree, planted near villages, in the North-West Himálaya. **Stewart** describes **U. campestris** as probably the same species as **U. Wallichiana,** *Planch.*, and **Sir J. D. Hooker,** in the *Flora of British India*, while retaining the two as distinct species, states that in all probability the tree described by **Brandis** as **U. campestris** is only a form of **U. Wallichiana.** These two species are very closely allied. both vary greatly in foliage, and the leaves take similar forms, so that a mistake might easily occur. The vernacular names would be the same for both. They are, therefore, not recognised as distinct by the Natives, are used for the same purposes, and may, for the purposes of this work, be considered under one species—**U. Wallichiana.** The mucilaginous properties of elm bark, well known in England, though now little utilised in medicine, do not appear to be recognised by the natives of India.

Ulmus lancifolia, *Roxb.; Fl. Br. Ind., V., 480;* URTICACEÆ. 2

Syn.—U. HOOKERIANA, *Planch.*

Vern.—*Lapi*, NEPAL; *Thalai*, BURM.

building (*Kurz*). TIMBER. 3

[261

U. integrifolia, *Roxb.;* see Holoptelea integrifolia, *Planch.;* Vol. IV.,

U. Wallichiana, *Planch; Fl. Br. Ind., V., 480.* 4

[& T.

brannú, merú, chipal, marál, mandú, mányi, maárn mamji, mal dúng morán, PB.

imb., 341; Valley, 93; Royle, Ill. 5; Hazára, 67; Agri.- 52.

laya, from

r cordage FIBRE. Bark. 5

neron an

h account Fibre. 6

Flower-stalk. 7

FODDER. Leaves. 8

TIMBER.

it is employed for making ark-poles. He, however, remarks that it is

U.

TIMBER. tough and has been found light, strong, and useful for the panels of dog-carts, etc. The timber of the smaller form, considered by **Brandis** to be **U. campestris**, is said by that author and by **Gamble** to be more valued than that of the larger typical **U. Wallichiana**. In Afghánistán the wood of the cultivated European Elm is much valued for making platters, small bowls, etc. (*Aitchison*).

DOMESTIC. Bark. 10 **Domestic.**—The fibrous BARK is made into slow matches and gun-fuses in the Panjáb.

UNCARIA, *Schreb.; Gen. Pl., II., 31.*

11 **Uncaria Gambier,** *Roxb.; Fl. Br. Ind., III., 31;* RUBIACEÆ.

GAMBIER, PALE CATECHU OR TERRA JAPONICA.

Syn.—NAUCLEA GAMBIER, *Hunter.*

Vern.—*Katt kutta*, HIND.; *Cáinai kathá*, BOMB.; *Ankudu kurra*, TEL.; *Gambir*, MALAY.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 173; Pharm. Ind., 117; Ainslie, Mat. Ind., II., 166; O'Shaughnessy, Beng. Dispens., 398; Dymock, Mat. Med. W. Ind., 2nd Ed., 413; Fleming, Med. Pl. and Drugs, in As. Res., XI., 187; Flück. & Hanb., Pharmacog., 335; Bent. & Trim., Med. Pl., 139; Murray, Pl. and Drugs, Sind, 195; Birdwood, Bomb. Pr., 43; Kew, Prod. Res., 367; McCann, Dyes and Tans, Beng., 128; Liotard, Dyes, 9; Smith, Dic., 183; Tropical Agriculturist, Apr. 1884, 671, 778; Agri.-Horti. Soc. Ind., Trans., IV., 184; VI., 130; Journals (Old Series) III., 57; V., Sel., 112; VII., Sel., 141, 142; VIII., Sel., 66, 68; VIII., 57.*

Habitat.—An extensive, scandent bush, met with, wild or cultivated, in Malacca, Penang, and Singapore; distributed to Java and Sumatra. It is largely cultivated at Singapore. In 1810 about 800 plantations were formed; in 1860 owing to scarceness of fuel and dearness of labour gambier-planting gave indications of disappearing from the island, but lately it is said to have again much increased.

TAN Leaves 12 Gambier 13 **Tan.**—From the LEAVES an extract is obtained, known as GAMBIER, or the officinal "pale catechu" of the Pharmacopœias of India and the United Kingdom. Much confusion existed in early literature regarding this substance which to a great extent was not separated from some of the forms of "true catechu" (see **Acacia Catechu**, Vol. I., 27-42). The first authentic account of gambier dates from 1780 and was written by a Dutch trader named **Couperus**. This author relates how the plant was introduced into Malacca from Pontian in 1758, how gambier was made from its leaves, and names several sorts of drugs and their prices.

Dr. Campbell of Bencoolen described the drug and the process of making it to Dr. Roxburgh, who also mentions that he had seen it made in the "islands to the eastward of the Bay of Bengal." It is also described by Fleming. At the present day it is made as follows:—

Leaves 14 Young shoots 15 The LEAVES and YOUNG SHOOTS are boiled in water for about an hour, at the end of which time they are removed, thrown into a capacious sloping trough, the lower end of which slopes into the pan, and squeezed with the hand so that the absorbed liquor may run back into the boiler. The decoction is then evaporated to the consistence of a thin syrup, and baled out into buckets. When sufficiently cooled, the workman pushes a stick to the bucket in a sloping direction, works it up and down, and rubs off the mass which thickens round the stick. By the motion thus caused the whole mass is kept agitated, and gradually sets. It is then placed in shallow square boxes and when somewhat hardened is cut into cubes and these are dried in the shade. The leaves are boiled a second time, and then washed in water, which water is saved for another operation. Of late

MEDICINE Gambier. 16

ficinal in the Pharmacopœias more ready solubility, pres and therapeutic properties to call for remark in such

agrees in chemical composition kind made in Northern India in, and they contain the yellow 36-38). CHEMISTRY 17

Food.—Gambier is very largely employed in India for eating with *pán* FOOD. 18

India, s, and, maund eturned they have been separated, and it is now definitely shown that the imports consist almost entirely of gambier, the exports of cutch. During the six years in which these articles have been considered separately, the imports of gambier have averaged 16,287 cwt., valued at R3,16,690. The total during 1880-90 TRADE. Gambier. 19

UNONA, *Linn. f.; Gen. Pl., I., 24, 956.* 20

A genus of erect or climbing trees or shrubs,

appear to be of economic interest except *U. pannosa, Dalz.* (*Fl. Br. Ind., I, 58*), a native of the Konkan and of the forests of Travancore. The inner BARK affords a strong FIBRE, said to be adapted for cordage and for paper-making (*Lisboa, U. Pl. Bomb., 226*). Bark. 21 Fibre. 22

An ingredient of "Dasamula."

URARIA, *Desv.; Gen. Pl., I., 521.*

23 **Uraria lagopoides,** *DC.; Fl. Br. Ind., II., 156;* LEGUMINOSÆ.

Syn.—HEDYSARUM LAGOPOIDES, *Burm.;* U. RETUSA, *Wall.;* DOODIA LAGOPIOIDES, *Roxb.;* U. HAMOSA, *Wall.*

Vern.—*Pitvan,* HIND.; *Chákuliá,* BENG.; *Davala,* MAR.; *Dowla,* BOMB.; *Kóla ponna,* TEL.; *Prisniparni, aughriparnika, atiguha,* SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 571; Elliot, Fl. Andhr., 15, 93; U. C. Dutt, Mat. Med. Hind., 147, 314; Dymock, Mat. Med. W. Ind., 2nd Ed., 221; Dymock, Warden & Hooper, Pharmacog. Ind., I., 426; Agri.-Horti. Soc. Ind., Journ. (Old Series), VI., 43.*

Habitat.—A native of the tropical zone from Nepál and Bengal to Burma; distributed to the Malay Islands, China, Polynesia, and Northern Australia.

MEDICINE. Plant. 24 Medicine.—"This PLANT is an ingredient of the *Dasamula,* and is thus much used in Native medicine. It is considered alterative, tonic and anticatarrhal, but is seldom used alone" (*Hindu Mat. Med.*). According to Susruta it was given with milk to women in the seventh month of their pregnancy to produce abortion. The properties attributed to it are probably entirely fanciful (*Pharmacog. Ind.*).

SACRED. 25 Sacred.—In Vedic times the plant was invoked as a goddess (*Pharmacog. Ind.*).

26 **U. picta,** *Desv.; Fl. Br. Ind., II., 155.*

Syn.—DOODIA PICTA, *Roxb.;* HEDYSARUM PICTUM, *Jacq.;* U. LINEARIS, *Hassk.*

Vern.—*Dábrá,* HIND.; *Sankar-jata,* BENG.; Seed=*deterdane,* PB.; *Prisniparni,* MAR.; *Pilavan, pitavan,* GUZ.; *Prisniparni,* BOMB.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 582; Dalz. & Gibs., Bomb. Fl., 65; Stewart, Pb. Pl., 77; Dymock, Mat. Med. W. Ind. 2nd Ed., 221; Dymock, Warden & Hooper, Pharmacog. Ind., 427; Atkinson, Him. Dist., 308; Gazetteer, Mysore & Coorg, I., 59; N.-W. P., I., 80; IV., lxx; Journals (Old Series), Agri.-Horti. Soc., N.S., VI., 43.*

Habitat.—An erect perennial, found from the Himálaya to Ceylon; it ascends to 6,000 feet in the North-West.

MEDICINE. Fruit. 27 Plant. 28 Medicine.—In the Panjáb the FRUIT is used as an application to the sore-mouths of children (*Stewart*). In Southern India the PLANT is supposed by the Hindus to act as an antidote to the poison of the *phúrsa* snake, Echis carinata (*Dymock*).

Urceola elastica, *Roxb.,* and U. esculenta, *Benth.;* APOCYNACEÆ; see Indian-rubber, Vol. IV., 361.

URENA, *Linn.; Gen. Pl., I., 205.*

29 **Urena lobata,** *Linn.; Fl. Br. Ind., I., 329;* MALVACEÆ.

Syn.—U. CANA, *Wall.;* U. PALMATA, *Roxb.*

Var. scabriuscula=U. SCABRIUSCULA, *DC.*

Vern.—*Bun-ochra,* BENG.; *Bhidi janetet',* SANTAL; *Bachita,* N.-W. P.; *Vana-bhenda,* MAR.; *Villiah,* KONKAN.; *Kat-sae-nai, wet-khyae-pa-nai,* BURM.; *Pattaappele,* SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 519; Dalz. & Gibs., Bom., Fl., 18; Thwaites, En. Ceyl. Pl., 25; Rev. A. Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 7896; Mason, Burma & Its People, 520, 755; Murray, Pl. & Drugs, Sind, 61; Baden Powell, Pb. Pr., 228; Royle, Fib. Pl., 263; Cross, Bevan, & King, Rep. on Ind. Fibre, 9, 43; Liotard, Paper Mat., 31; Atkinson, Him. Dist., 306; Lisboa, U. Pl. Bomb., 228; Gazetteers:—Mysore & Coorg, I., 58; Bombay, XV., 427; N.-W. P., IV., lxviii; Agri.-Horti. S[illegible] Journ. (Old Series), IX., 405, Sel., 47.*

Habitat.—A common herb, generally distributed throughout the hotter parts of India, very frequent in waste places, and in the bamboo and mango clumps of Bengal

Fibre.—The BARK yields a good, easily extractable fibre, which is considered suitable for the manufacture of sacking and twine, and a fair substitute for flax Messrs. Cross, Bevan & King found that it contained 77 7 per cent. of cellulose and lost by hydrolysis 11 9 per cent, when boiled for five minutes in 1 per cent. Na_2O; 18·5 when boiled for an hour. The length of the ultimate fibre is 1·5 to 2·0 mm. FIBRE Bark 30

Medicine.—In Chutia Nagpur the ROOT is employed as an external remedy for rheumatism MEDICINE. Root 31

Urena repanda, *Roxb.; Fl. Br. Ind., I., 330;* WIGHT, *Ill., I., 65.* 32

Syn.—U. RIGIDA, *Wall. Cat. 1929 (in part)*; U. HAMILTONIANA, *Wall*, U. SPECIOSA, *Wall*, PAVONIA REPANDA, *Spreng*

Vern.—*Sikuar*, SANTAL.

References.—*Roxb, Fl. Ind, Ed C.B C 519, Campbell, Ec Pl. Chutia Nagpur, No 8740, Atkinson, Him. Dist, 306, Aplin, Rep on Shan States; Gazetteer., N.-W. P., IV, lxviii.*

Habitat.—An undershrub met with in North-West India, the Upper Gangetic plain, the Western Peninsula, and Burma.

Medicine.—The ROOT and BARK are believed by the Santals to be a cure for hydrophobia (*Campbell*). MEDICINE. Root. 33 Bark. 34

U. sinuata, *Linn.; Fl. Br. Ind, I., 329* 35

Syn.—U MURICATA, *DC.*, U. LAPPAGO, *DC.*; U. MORIFOLIA, *DC*, U HETEROPHYLLA, *Smith*; U. TOMENTOSA, *Wall.*

Vern.—*Lotloti, kunjáya*, HIND; *Kunjia*, BENG, *Mota bhedi janetet'*, SANTAL; *Tapkoté*, BOMB.; *Piliya mankena*, TEL; *Hinappele*, SING

References.—*Roxb., Fl. Ind, Ed. C B C, 519, Dals & Gibs, Bomb Fl, 18; Thwaites, En. Ceyl. Pl., 25; Burm, Fl. Zeyl, t 69, f. 2, Rev A Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 8492, Elliot, Fl Andhr, 152; Lisboa, U. Pl. Bomb, 228, Gazetteers—Bombay, XV, 428, N.-W. P, IV., lxx ii.*

Habitat.—A small bush, with deeply gashed leaves, found throughout the hotter parts of India.

Fibre.—The BARK yields a strong and tolerably fine FIBRE, which, like that from **U. lobata**, may be used as a substitute for flax. Mr. Cameron states that the plant attains its full size in wet land or by the margins of streams and tanks, and that, if necessary, it might be cultivated in the same way as jute. FIBRE. Bark 36 Fibre. 37

Medicine.—In Chutia Nagpur the ROOT is used as an external application for lumbago. MEDICINE. Root. 38

URGINEA, *Steinh.; Gen. Pl, III., 810.*

Urginea indica, *Kunth.; Fl. Br. Ind. VI., 347; Wight, Ic, t. 2063;* [LILIACEÆ 39

INDIAN SQUILL.

Syn.—SCILLA INDICA, *Roxb.*; U. SENEGALENSIS, *Kunth.*, S. CUNDRIA & S DENUDATA, *Ham.*

Vern.—*Kándá, jangli-piyás, kánde*, HIND; *Jongli piaaj, ban-piadj, kande*, BENG; *Iskil, kándri, kunda*, N.-W. P; *Ghesuwa*, KUMAON; *Phaphor, kachwassal*, PB; *Jangli-piyás, kandrá*, DECCAN; *Jangli-piás, kol-kánda, kochinda, jangli kanda, rána kándá*, BOMB.; *Ranúcha-kándé*, MAR; *Jangli-kánda, ran-kando*, GUJ.; *Nari-vengávam*, TAM.; *Nakka vulli-gadda*, TEL; *Adavi-irulli*, KAN.; *Káttulli*, MALAY; *To-kesún, tankaet-tva, pa-daing-kyet-thwon*, BURM.; *Val-lúnú*, SING.; *Vana-palándam*, SANS; *Isqile-hindí aansale-hindí baslul-fáre-hindi, baslul-barre hindí*, ARAB.; *Piyaze-dashtié-hindi, piyáze-moshe-hindi*, PERS.

URGINEA Scilla.

The Squill.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 289; Stewart, Pb. Pl., 235; Dalz. & Gibs., Bomb. Fl., 250; Grah., Cat. Bomb. Pl., 220; Mason, Burma & Its People, 814; Pharm. Ind., 241; Ainslie, Mat. Ind., I., 402; O'Shaughnessy, Beng. Dispens., 662; Moodeen Sheriff, Supp. Pharm. Ind., 250; Dymock, Mat. Med. W. Ind., 2nd Ed., 829, 887; Flück. & Hanb., Pharmacog., 693; Irvine, Mat. Med. Patna, 41; Official Corresp. on the Proposed New Pharm. Ind., 226, 235, 239, 295; 325; Atkinson, Him. Dist., 319, 752; Drury, U. Pl., 438; Birdwood, Bomb. Pr., 91; Bidie, Prod. S. Ind., 45; Agri.-Horti. Soc. Ind., Trans., VI., 241.*

Habitat.—Found in sandy soil, especially near the sea, throughout India, also in the drier hills of the lower Himálaya, and on the Salt Range at altitudes of about 2,000 feet. The bulb is said by Atkinson to be exported largely from the lower hills of the North-West Provinces.

MEDICINE. Bulb. 40 Medicine.—The Hindus use the BULB in the preparation of *chandi-bhasma* or "ashes of silver," which they employ medicinally. "Indian Mahometan writers evidently consider the Indian squill as identical in medicinal properties with the squill of the Greeks; they prescribe it in paralytic affections, also as an expectorant, digestive, diuretic, deobstruent and emmenagogue, in many diseases, more especially in asthma, dropsy, rheumatism, calculous affections, leprosy, and skin diseases" (*Dymock*). European writers vary much in their opinions regarding the medicinal properties of the drug. Ainslie states that it "is chiefly employed by farriers for horses in cases of strangury and fever." Roxburgh writes that the bulb is quite as nauseous and bitter as that of the officinal squill; while O'Shaughnessy remarks that bulbs examined by him were inodorous, nearly tasteless, and devoid of any medicinal property. Bidie, Atkinson, U. C. Dutt, K. L. De, Dymock and others confirm the statement that the drug is an efficient substitute for Urginea Scilla. Moodeen Sheriff explains the discrepancy by stating that when young and small, not exceeding a lime in size, it acts as a diuretic, in doses of 10-20 grains, even more powerfully than the officinal squill, but that as it grows larger it becomes useless. The outer coats are always quite inert. It is also possible, as suggested by O'Shaughnessy, that the medicinal virtues may vary with the season and locality of collection. The officinal squill is well known to be thus affected. On the Spanish coast it has been found quite inert in one locality, while as active as usual at the distance of a few miles. A sufficient proof of its value, if collected and stored judiciously, is found in the fact that, for many years, it has been used as a substitute for the officinal squill at the Government Medical Store Depôt in Bombay. The dried bulb met with in bazárs sells at from 1 to 2 annas per ℔ according to quality (*Dymock*).

Special Opinions.—§ "The Indian squill is said to grow in abundance in Pathankot, and to be as useful as the officinal squill" (*Assistant Surgeon Bhagwan Das, Rawalpindi*). "The bruised bulbs are applied as a poultice to rheumatic pains or contusions and are much esteemed by the people" (*Lal Mahomed, Hospital Assistant, Hoshangabad, Central Provinces*). "Has been the only kind of squill used in the Bombay Depôt for the last ten years; it has proved quite satisfactory" (*W. Dymock, Bombay*).

FOOD. Leaves. 41 Food.—The LEAVES were eaten in the Khandesh District during the famine of 1877-78 (*Dymock*).

DOMESTIC. Juice. 42 Domestic.—The JUICE of the fresh bulb is said to be employed in the North-West Provinces to give body to thread (*Stewart*).

43 **Urginea Scilla,** *Steinheil.*

THE SQUILL.

Syn.—SCILLA MARITIMA, *Linn.*; URGINEA MARITIMA, *Baker.*

Habitat.—A perennial herb, found on the ... erranean
Medicine.—The ... European MEDICINE. Bulbs.
medicine. ... require notice
in this work 44

URINE. 45

Urine.

Vern.—*Peshâb*, HIND.; *Mutra*, SANS.
Reference.—*U. C. Dutt, Mat. Med., Hind.*, 84.

Dye.—Stale urine is a common constituent of the indigo fermentation-vat (see Indigo, Vol. IV., 459). Indian Yellow, or *Peori*, is extracted from the urine of cows fed in a particular way (see Peori, VI., Pt I., 132) DYE. 46

Medicine.—The URINE of various animals has long been esteemed and much used in Sanskrit medicine. That of the cow is specially valued; it is employed in the purification of many metals for medicinal use, and is a common vehicle of iron prescribed for anæmia. U. C. Dutt (*Mat. Med. Hind.*) gives an interesting account, which may be quoted in entirety:— "The properties of the urine of various animals, such as the cow, buffalo, goat, sheep, horse, elephant, ass, and camel are minutely described. Of these cow's urine is much used both internally and externally in the purification of various metals and in the preparation of oils, decoctions, etc. It is described as laxative, diuretic, and useful in constipation, suppression of urine, colic, anasarca, jaundice, leprosy, and other skin diseases. Goat's urine is sometimes given internally. In congestive fever, with constipation, flushed face, and headache, an ounce of fresh and warm cow's urine is given as a domestic medicine. It is sometimes given as a vehicle for administering castor oil." Cow's urine is used in the preparation of various complicated medicines for the above enumerated diseases, of which Dutt gives two examples, from the *Bhâvaprakâsa* and *Chakradatta*. The first is an extract of various drugs made with cow's urine, to which iron rust is added and administered internally; the second is an oily preparation said to be useful in leucoderma, chronic prurigo, and other obstinate skin diseases. MEDICINE. Urine. 47

Urostigma, see Ficus, *Linn*; URTICACEÆ; Vol. III., 342-362.

URTICA, *Linn.*; *Gen. Pl*, *III.*, 381. 48

This, the typical genus of the Nettle Family, comprises some thirty species, natives of Temperate and Sub-tropical regions, of which three are natives of India. In earlier works on Indian Botany this genus was made to include a large number of plants which by more careful study have been broken up into some twelve or thirteen genera—see, Bœhmeria, Vol. I, 465-484; Debregeasia, Vol. III, 52-54; Girardinia, Vol. III., 498-502; Laportea, Vol. IV., 587; Maoutia, Vol V., 177-180; Pilea, Vol. VI., Pt I., 236; Pouzolzia, Vol. VI., Pt. I., 334; Sarchoclamys, Vol. VI, Pt. II., 476; and Villebrunea, p. 239.

Urtica dioica, *Linn.*; *Fl. Br. Ind.*, *V.*, *548*; URTICACEÆ. 49
THE COMMON STINGING NETTLE.

Vern.—*This, like other stinging nettles, is probably known in the Panjáb Himálaya as bichu, bichúa, or chichrá=the 'scorpion' or 'stinger.'*

Habitat.—Found in the North-West Himálaya from Kashmir and the Salt Range to Simla and Western Tibet, at altitudes from 8,000 to 12,000 feet. No information is available regarding the economic utilisation of this plant in India, but in Europe it has from the remotest times enjoyed the reputation of possessing many useful properties, which may be here briefly referred to.

VACCINIUM, *Linn.; Gen. Pl., II., 573.*

1 **Vaccinium Leschenaultii,** *Wight; Fl. Br. Ind., III., 455;* [*Wight, Ic., t. 1188;* VACCINIACEÆ.

Syn.—ANDROMEDA SYMPLOCIFOLIA, *Wall;* AGAPETES SYMPLOCIFOLIA, *G. Don;* A.? ARBOREA, *DC.*

Var. arborea.

Var. rotundifolia=V. ROTUNDIFOLIA, *Wight.*

Var. zeylanica.

Vern.—*Andúvan,* NILGIRIS.

References.—*Beddome, Fl. Sylv., t., 277; Madras, Man. Admin. I., 314; Ind. Forester, II., 23, 26.*

Habitat.—A tree of the mountains of Southern India and Ceylon, common at altitudes from 4,000 to 8,000 feet.

FOOD. Fruit. 2 **Food.**—It produces an edible FRUIT, which is eaten by the Natives of the Nilgiris.

3 **V. serratum,** *Wight; Fl. Br. Ind., III., 452; Wight, Ic., t. 1184.*

Syn.—CERATOSTEMMA VACCINIACEUM, *Roxb.;* GAYLUSSACCIA SERRATA, *Lindl.;* AGAPETES SERRATA, *G. Don.*

Vern.—*Charu,* NEPAL; *Kesa prúm,* GARO.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 374; Gamble, Man. Timb., 234.*

Habitat.—A shrub, often epiphytic, found in Sikkim, Bhután, and the Khásia Hills, from 4,000 to 8,000 feet.

FOOD. Flowers. 4 **Food.**—Roxburgh states that the FLOWERS have an acid taste, and are eaten by the Natives of the Gáro Hills in their curries.

Vachellia Farnesiana, *W. & A.,* see **Acacia Farnesiana,** *Willd;* [LEGUMINOSÆ; Vol. I., 48.

VALERIANA, *Linn.; Gen. Pl., II., 154.*

5 **Valeriana Hardwickii,** *Wall; Fl. Br. Ind., III., 213; Wight,* [*Ic., t. 1045-6;* VALERIANEÆ.

Syn.—V. TENERA, *Wall;* V. ELATA, *Don;* V. JAVANICA, *Blume;* V. ACUMINATA, *Royle.*

Var. Hoffmeisteri, *Klotzsch* (Sp.).

Var. Arnottiana, *Wight* (Sp.).

Vern.—*Tágger, shumeo, asarún,* HIND.; *Tágger, balchur, úshur,* BENG.; *Naháni, chár,* the root=*ásárun, bála, taggar,* PB.; *Shumeo, asárun,* KUMAON; *Tagger-ganthoda,* BOMB.; *Char,* C. P.

References.—*Stewart, Pb. Pl., 118; Pharm. Ind., 120; Irvine, Mat. Med. Patna, 17; Dymock, Mat. Med. W. Ind., 2nd Ed., 419; Year-Book Pharm., 1873, 78, 284; 1878, 289; Atkinson, Him. Dist., 311, 753; Royle, Ill. Him. Bot., 241; Settle. Rep., Belaspore, 77.*

Habitat.—A perennial herb of the Temperate Himálaya, from Kashmír to Bhután, at altitudes of 4,000 to 12,000 feet; also met with in the Khásia Mountains, between 4,000 to 6,000 feet.

PERFUME. Root. 6 **Perfume.**—The ROOT is exported to the plains partly for medicinal use, but mainly as a perfume. It is chiefly employed to scent and clean the hair (*Irvine*), and is also, when dry, burned as incense (*Atkinson*).

MEDICINE. Root. 7 **Medicine.**—The ROOT has probably long been used in India, but from the fact that it does not appear to be mentioned in any standard wor[k] on Hindu Materia Medica, it has possibly been always, as it is no[w,] more valued as a perfume than as a drug. Dymock informs us that it [is] described by Muhammadan physicians as an Indian kind of *asárun* (As[a-]rabaca). The author of the *Makhzan-el-Adwiya* mentions several kinds [of] *asárun,* but states that the Indian *tágger* is to be preferred. The medi[...]

nal properties attributed to it by him resemble those of Nardostachys Jatamansi—see Vol. V., 338 (*Mat Med W. Ind.*) Stewart states that in the Panjáb it is employed medicinally, its properties being similar to those of the Valerians of Europe In the North-West Provinces also, it is believed to possess anti-spasmodic properties (*Atkinson*). According to Dr. Adams the Syrian Nard of the ancients was probably the root of this plant (*Pharm. Ind.*). There is little doubt that it may prove an efficient substitute for the officinal Valerian; it is, at any rate, worthy of fair trial, and of chemical examination.

MEDICINE.

Valeriana officinalis, *Linn.*; *Fl. Br. Ind., III., 211.* 8

COMMON VALERIAN.

Syn —V DUBIA, *Bunge*

Vern.—*Kalávála*, MAHR; *Jalalakan, billi-lotan*, AJM.

References —*Bentley & Trimen, Med. Pl, t. 146, O'Shaughnessy, Beng. Dispens., 402, Pharm. Ind., 119, Flück. & Hanb., Pharmacog, 377, Smith, Econ. Dict., 425; Year-Book Pharm, 1874, 626, 1879, 468, Med. Top Ajmere, 139*

Habitat.—Found in North Kashmír, at Sonamurg, altitude 8,000 to 9,000 feet.

Medicine.—Valerian ROOT is officinal in all modern Pharmacopœias, and its well known properties require no comment in this work. It is imported into India with other officinal drugs, in small quantities; but it is little known to Natives, by whom the common and more easily obtainable species are employed as substitutes.

MEDICINE. Root. 9

V. Wallichii, *D.C.*; *Fl. Br. Ind., III., 213.* 10

Syn.—V. VILLOSA, *Wall.*, V. JATAMANSI, *Jones*; V. SPICA, *Vahl.*

Vern —*Dúlá, wálá, bálá, char, bala mushk, mushkwáli, char godar*, root = *bála, dsárun, taggar*, PB., *Mah kák, gúr-balchor-ák*, AFGHAN.

References —*Roxb., Fl. Ind., Ed. C.B.C., 55, Stewart, Pb. Pl, 118; Pharm Ind., 120, O'Shaughnessy, Beng. Dispens., 403; Ainslie, Mat. Ind, II, 387; Fleming, Med. Pl. & Drugs in As. Res, XI., 181; Baden Powell, Pb. Pr., 354, Atkinson, Him Dist., 311; Agri-Horti. Soc Ind, Journ. (Old Series), XIV, 15.*

Habitat.—Grows in Temperate Himálaya from Kashmir to Bhután, at an altitude of 10,000 feet, also in the Khásia Mountains, altitude 4,000 to 6,000 feet.

Perfume, Medicine, Domestic.—The ROOT is used in every way similarly to that of V. Hardwickii. It has been confused by Ainslie, O'Shaughnessy, and others with Nardostachys Jatamansi, which see Vol. V., 338.

PERFUME, MEDICINE, DOMESTIC. Root. 11

VALLARIS, *Burm.*; *Gen. Pl., II., 710.*

Vallaris Heynei, *Spreng*; *Fl. Br. Ind., III., 650*; *Wight, Ic., t.* [438; APOCYNACEÆ. 12

Syn.—V. DICHOTOMA, *Wall*; ECHITES DICHOTOMA, *Roxb.*; PELTANTHERA SOLANACEA, *Roth.*

Vern —*Rámsar, chamari-ki-vel*, HIND.; *Hápar máli, rámsar*, BENG; *Dúdhi*, KUMAON; *Putta podara yárala, pála malle tivva*, TEL; *Bhadravalli, bhadramunjá, visalyakrit*, SANS.

References —*Roxb, Fl. Ind., Ed. C.B C, 247; Kurz, For. Fl, Burm, II., 181; Brandis, For. Fl, 327; Thwaites, En. Ceyl. Pl, 192; Dalz & Gibs, Bomb Fl, 144; Gamble, Man. Timb, 262; Elliot, Fl. Andhr 142, 161; U. C. Dutt, Mat. Med. Hind., 293, 324; Atkinson, Him Dist., 313, 753; Gazetteers —Mysore & Coorg, I., 62, N.-W. P., I, 82, IV., lxxiv.; Ind. Forester, X., 325; Agri.-Horti. Soc. Ind., Journ. (Old Series), X., 16.*

Habitat.—A large climbing shrub, found in the Tropical Himálaya, ascending to 5,000 feet in Kumáon; also met with in Sylhet, Burma, South India (from the Konkan southwards), and in Ceylon. It is commonly cultivated in gardens throughout the country.

MEDICINE. Juice. 13

Medicine.—The milky JUICE is employed as an application to wounds and old sores in the North-West (*Atkinson*).

SPECIAL OPINIONS.—§ "Useful in cases of fistula, the juice is corrosive" (*U. C. Mukerji, M.B., C.M., Civil Medical Officer, Dinagepore*). "The milky juice is very useful for chronic ulcers and sinuses, and in whitlow" (*Surgeon W. Wilson, Bogra*). "Especially useful in onychia (whitlow)" (*Surgeon A. C. Mukerji, Noakhally*). "The milky juice is a mild irritant. Applied to old sores and sinuses, it excites some degree of inflammation in them and thereby expedites the process of healing" (*Assistant Surgeon R. C. Gupta, Bankipore*). "The juice of the twigs is a useful application to old sores and sinuses" (*Civil Surgeon J. H. Thornton, B.A., M.B., Monghyr*).

VALLISNERIA, *Linn.*; *Gen. Pl., III., 451.*

14 **Vallisneria spiralis**, *Linn.*; *Fl. Br. Ind., V., 660.*

Syn.—V. SPIRALOIDES, *Roxb.*

Vern.—*Sámala, syala*, HIND.; *Punatsu, pancha-dub*, TEL.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 710; Stewart, Pb. Pl., 241; Baden Powell, Pb. Pr., 306; Balfour, Cyclop., III., 958; Gazetteer:—N.-W. P., I., 84; IV., lxxxii; Ind. Forester:—IV., 234; XII., app., 21; XIV., 393; Agri.-Horti. Soc. Ind., Journ. (Old Series), XII., Pro., 12.*

Habitat.—A submerged herb, found in water throughout India and Ceylon.

DOMESTIC. Leaves. 15

Domestic, etc.—The moist succulent LEAVES are employed to cover the surface of sugar in the Native process of refining, see **Phœnix dactylifera**, Vol. VI., Pt. I., p. 213; see **Sugar**, Pt. II, pp. 31, 267, 311, etc.

16 **Valonia Cups.**—The acorn cups of **Quercus ægilops**, the "prickly-cupped oak," are known in commerce under this name. The tree grows in the Morea, from which large quantities are shipped to Europe, where they are highly valued for tanning purposes.

VANDA, *Br.*; *Gen. Pl., III., 578.*

17 **Vanda Roxburghii**, *R. Br.*; *Fl. Br. Ind., VI., 52; Wight, Ic., t. 916*; ORCHIDEÆ.

Syn.—CYMBIDIUM TESSELLOIDES, *Roxb.*; C. TESSELLATUM, *Swartz.*; EPIDENDRUM TESSELLATUM, *Roxb.*; ÆRIDES TESSELLATUM, *Wight.*

Vern.—*Rásna, nai, vandá, bandá, persárá, perasárá*, HIND.; *Rásná, nái*, BENG.; *Dare banki*, SANTAL; *Rásna*, MAR.; *Rasno*, GUZ.; *Rásná*, BOMB.; *Kanapa chettu badanike, mardaru, chittedaru*, TEL.; *Rásná, vandáka, nákuli, gandhanákuli*, SANS.

References.—*Sir W. Elliot, Fl. Andhr., 44, 81, 112; Sir W. Jones, Treat. Pl. Ind., 147; Rev. A. Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 9292; U. C. Dutt, Mat. Med. Hind., 259, 310, 315, 322; Dymock, Mat. Med. W. Ind., 2nd Ed., 792; Cat., Baroda Durbar, Col. & Ind. Exhb., No. 181; Year-Book Pharm., 1880, 251; Gazetteer, Mysore & Coorg, I., 72.*

MEDICINE. Root. 18

Medicine.—Under the name of *rásna* the ROOTS of this orchid and of **Acampe papillosa**, *Lindl.* (see Vol. I., 64), are indiscriminately used by native physicians. They are believed to be fragrant, bitter, and useful in rheumatism and allied disorders for which they are prescribed in a variety of forms. They also enter into the composition of several medicated oils for external application in rheumatism and diseases of the

nervous system (*U. C. Dutt*). It is also said to be considered a remedy for secondary syphilis. The Rev. A Campbell informs us that, in Chutia Nagpur, the LEAVES, pounded and made into a paste, are applied to the body during fever, and that the JUICE is introduced into the aural meatus as a remedy for otitis media.

MEDICINE. Leaves. 19 Juice. 20

Domestic.—"Santal girls split up the LEAVES and wear them as anklets, hence the name '*dare banki*,' or 'tree anklet'" (*Campbell*).

DOMESTIC. Leaves. 21

VANGUERIA, *Comm.*; *Gen. Pl.*, *II.*, *111.*

Vangueria edulis, *Vahl.*; *Fl. Br Ind*, *III.*, *136*; RUBIACEÆ. 22

THE VOA-VANGA OR VOA-VANGUER OF MADAGASCAR

Vern.—*Moyen*, ASSAM; *Helu*, *alu*, MAR., *Abú*, BOMB.; *Voa-vanga*, MADAGASCAR

References.—*Kurz*, *For. Fl. Burm*, *II*, *34*; *Dymock*, *Mat Med. W. Ind.*, *2nd Ed.*, *890*, *Gazetteers*:—*Mysore & Coorg*, *I.*, *61*; *Cent Prov*, *223*, *Bombay*, *X.*, *402*

Habitat.—A small tree, native of Madagascar, resembling **V.** spinosa, but unarmed; cultivated in India for the sake of its edible fruit.

Food.—Its FRUIT is eaten by the people of Madagascar, from whose vernacular name the botanical name of the genus has been derived. In India it is frequently used as an article of food.

FOOD. Fruit. 23

Domestic.—The timber is occasionally employed for economic purposes in India (*Bomb. Gas.*, *X.*, *402*).

DOMESTIC. 24

V. spinosa, *Roxb.*; *Fl. Br. Ind.*, *III.*, *136.* 25

Syn.—V. MOLLIS, *Wal.*; V. SPINOSA & V PUBESCENS, *Kurz*; V EDULIS, *Miq.*, PYROSTRIA; SPINOSA, *Miq.*

Vern—*Muyuana*, *muduna*, *moina*, HIND.; *Muyna*, *mainphal*, *muyuana*, *muduna*, *moina*, BENG, *Gél*, *mainphal*, C P; *Alu*, *alu*, BOMB.; *Alu*, MAR.; *Chéga gadda*, TEL, *Hsay-ma-kyi*, BURM., *Pindituka*, SANS.

References—*Roxb.*, *Fl. Ind*, *Ed. C.B.C.*, *180*; *Kurz*, *For. Fl Burm.*, *II*, *34*; *Dals. & Gibs*, *Bomb. Fl*, *114*, *Gamble*, *Man Timb.*, *119*, *Elliot*, *Fl. Andhr.*, *35*, *Birdwood*, *Bomb Prod.*, *163*, *Lisboa*, *U Pl Bomb*, *87*, *162*; *Buchanan*, *Statistics*, *Dinajpur*, *152*, *Taylor*, *Top Dacca*, *49*, *Gazetteer*:—*Bombay*, *XIII.*, *23*, *XV*, *436*; *XVII.*, *23*, *XVIII.*, *31*, *Cent. Prov.*, *223*, *Settlement Report*, *Central Prov*, *Chanda*, *App. vi.*

Habitat.—A large thorny shrub, found from Northern Bengal to Canara, also in Burma, Pegu, and Tenasserim. It flowers in the beginning of the hot season, after which the fruit ripens in three or four months.

Medicine.—The dry FRUIT is said to possess narcotic properties (*Cent. Prov. Gas.*), and to be a remedy for boils (*Chanda Settl. Rept.*).

MEDICINE. Fruit. 26

Food & Fodder.—The FRUIT is round, of the size of a cherry, smooth, yellow when ripe, and succulent. Considerable differences of opinion are expressed regarding its quality. Roxburgh states that it is eaten by Natives. Lisboa writes, "Eaten cooked or roasted, but it is not palatable." Taylor, on the other hand, remarks that it is considered a fruit of great delicacy, and is common in the bazárs of Dacca during November and December; while Buchanan writes, "It possesses an intoxicating or rather deleterious quality, when fresh plucked, but after being kept a few days, may be eaten without danger and is said to be sweet and agreeable." In the Central Provinces it is said to be used as a vegetable when *green*, and to be narcotic when *dry* (*C. P. Gazetteer*, *223*). From these conflicting statements the fruit would appear to vary in different localities, or with cultivation, or according to its age. The LEAVES are said to be a useful fodder.

FOOD & FODDER. Fruit. 27

Leaves. 28

VANILLA.

29 **Vanilla** is the long pod-like fruits of the epiphytic Orchid named. **V. planifolia.** It is a native of the West Indies and of tropical America. It has been experimentally grown in India, but the degree of success hitherto attained has not justified the establishment of plantations. The grateful aromatic qualities of **Vanilla** are fully utilized in confectionery, perfumery, and medicine. It is relative to its bulk perhaps the most expensive article of the vegetable kingdom which can be classed as a commercial product. The major portion of the British supplies are drawn from Mexico. The active principle Vanilline is now imitated chemically in preparations from pine-wood and clove oil.

VARNISH.

30 **Varnish.**—A varnish is generally defined as a solution of a resin, or gum-resin in a liquid, which, when spread over a surface, evaporates and leaves the solid in the form of a transparent more or less coloured film. The chief resinous substances employed in the manufacture of varnishes are amber, benzoin, copal, colophony, dammer, elemi, lac, mastic, sandarach, **Vateria** resin, and the coniferous resins. The chief solvents are linseed oil, oil of turpentine, oil of rosemary, alcohol, and ether. The solutions thus formed are variously coloured by the addition of dyes of the desired tint. For an account of the above enumerated substances the reader is referred to the article on each, in its respective alphabetical position. In addition to these, however—the varnishes of commerce—India is rich in plants which yield natural varnishes, *i.e.*, resinous substances which naturally exist in a form suitable for immediate use as varnishes. The principal of these are derived from the following plants:—

Buchanania latifolia.
Holigarna, several species, the Black Varnish of Malabar.
Melanorrhœa usitata, the Black Varnish of Burma.
Odina Wodier.
Rhus, several species—the Japan Varnish.
Semecarpus, the Black Varnish of Sylhet, South India, and Ceylon

Full accounts of these varnishes will be found in the article on each i its alphabetical position in this work.

VATERIA, *Linn.*; *Gen. Pl.*, *I.*, 193. DIPTEROCARPEÆ.

31 **Vateria indica**, *Linn.*; *Fl. Br. Ind.*, *I.*, 313; PINEY VARNISH, or IN THE WHITE DAMMAR of South India, PINEY VARNISH, or IN COPAL.

Syn.—V. MALABARICA, *Blume.*

Vern.—*Sufêd-dámar, kahruba, sandras*, HIND.; *Chundrus*, BENG.; S *dámar*, DECCAN; *Rál*, BOMB.; *Vellai-kunrikam, vellai-dámar, kúndricum, kúndricum, paini-pishin, kungiliyam, vellai-kung piney maram, dhup maram*, TAM.; *Dúpa-dámaru, tella dámaru, d* TEL., *Dupa maram, dhupa, paini, munda dhup, dhupadamara Payana, vella-kunturukkam, peinimarum. vella-kúdricum, pai painimara, vella kondrikam*, MALAY.; *Hal, hal-dumula*, SING

References.—*Roxb., Fl. Ind., Ed. C.B.C.*, 436; *Beddome, Fl.* 84; *Gamble, Man. Timb.*, 41; *Graham, Cat. Bomb. Pl.*, 22 *Burma & Its People*, 486, 526, 757; *Rheede, Hort. Mal., IV Pharm. Ind.*, 33; *Ainslie, Mat. Ind., II.*, 482; *O'Shaughne Dispens.*, 221; *Irvine, Mat. Med. Patna*, 25; *Moodeen She Pharm. Ind.*, 253; *Mat. Med. S. Ind.* (in MSS.), 48; *Dy Med. W. Ind., 2nd Ed.*, 93; *Dymock, Warden & Hoope cog. Ind., I.*, 196; *Official Corresp. on Proposed New Ph*

VATERI indica.

238; Birdwood, Bomb. Prod., 258; Drury, U. Pl. Ind., 439; Useful Pl. Bomb. XXV. (Bomb. Gaz.), 15; Econ. Prod., N.-W. Prov., Pt. I (Gums and Resins), 3; Gums & Resinous Prod. (P. W. Dept. Report), 2, 3, 5, 6, 7-9, 10, 20, 30, 37, 57, 65, 67; Cooke, Gums and Resins, 87; Bidie, Prod. S. Ind., 21; Man. Madras Adm., I., 314, II., 105; Nicholson, Man. Coimbatore, 41; Gazetteers:—Bombay, XV., Pt. I., 31, 78; Mysore & Coorg, I., 46, 53; Agri-Horti. Soc., Ind., Journ. (Old Series), VIII., Sel., 141; IX., 293, 294; Indian Agriculturist, March 17, 1888; Ind. Forester, II., 21; VI., 125.

Habitat.—A large evergreen tree of the Western Peninsula, from Kanara to Travancore, ascending to 4,000 feet.

Resin.—This tree yields a true resin of considerable value, known as white dammar, or Piney resin. It occurs in three forms:—1st, COMPACT PINEY RESIN, in lumps of all shapes which varies in colour, on the outside, from bright orange to a dull yellow, has a bright vitreous fracture, and internally presents all shades of colour from a light green to a light yellow. It is very hard, and bears a general resemblance to amber, from which characteristics, added to its colour, it may be easily distinguished from all other Indian resins. 2nd, CELLULAR PINEY RESIN, occurs either in small lumps or in large masses, generally of a shining appearance and balsamic smell. It has a distinctly cellular structure, partly owing to the mode of collection, and partly to the age of the tree. Notches are cut in the trunk of the tree sloping downwards and inwards, the resin collects in the cavity and is either permitted to dry *in situ*, or is collected and dried by heat. It varies in colour from light green to yellow or white, and is usually transparent, though occasionally from want of care in preparation, more opaque, of a dull green colour, and full of air bubbles. 3rd, DARK COLOURED PINEY RESIN, is occasionally obtained on splitting open old and decayed trees. It has the solid consistence of the first, but the inferior quality of the second variety (*Jury Rept. Madras Exhb.*, 1857).

RESIN.

Cellular Piney Resin. 32

Dark coloured Piney Resin. 33

This resin, from its valuable characters, has naturally given rise to considerable interest on the part of European writers, attended with not a little confusion as to its real nature. It has been confused, to begin with, with gum animi, a resin derived from Zanzibar. The following report by Mr. Broughton, late Quinologist to the Government of Madras, gives an interesting and fairly complete account of the preparation and uses of the substance, and may be quoted in its entirety:—

"This beautiful substance has long been known, and its properties and local uses have been repeatedly described. It is also not unknown in England, and I apprehend that its cost (and perhaps also ignorance of its peculiar properties) has prevented its becoming an article of more extended commerce. It should be remarked that the "East Indian Dammar," which is well known among varnish-makers, though frequently confounded with this, is the product of a very different tree, and is not produced in this Presidency. The finest specimens of Piney resin are obtained by making incisions in the tree, and are in pale green translucent pieces of considerable size. The resin that exudes naturally usually contains much impurity. In most of its properties it resembles copal, but it possesses qualities which give it some advantage over that resin. Like copal it is but slightly soluble in alcohol; but as Berzelius pointed out in the case of copal, it can be brought into solution by the addition of camphor to the spirit. It is easily soluble in chloroform, and thus might find a small application as a substitute for amber in photographer's varnish. It differs most advantageously from copal in being at once soluble in turpentine and drying oils, without the necessity of the preliminary destructive fusion required by that resin,—a process which tends greatly to impair the colour of the varnish. The solution of Piney resin in

RESIN.

turpentine is turbid and milky, but by the addition of powdered charcoal, and subsequently filtering, it yields a solution transparent and colourless as water, and a varnish which dries with a purity and whiteness not to be surpassed. The solution in turpentine readily mixes with the drying oils. It is on these properties of the resin that its chance of becoming an article of trade will depend. In price it cannot expel copal, the supply of which to the European market is regular and abundant. Major Beddome informs me that the cost of the Piney resin delivered on the sea-coast would be about R6 per maund of 25lb. The present price of the best copal in the English market is but £2-10 per cwt." In the list of resins of Mysore and Coorg contained in the Public Works Department report the same price is quoted for the inferior, and R8 per 25lb for the finer, quality. The remark is appended, "of excellent quality and procurable in great abundance in the Nuggur, Mulnaad, Munjerabad, and Coorg:—the supply is almost unlimited. In Nuggur extensive avenues of this tree alone exist, besides numerous isolated trees in the jungles." Moodeen Sheriff quotes the present bazár price in Madras, as, of the superior variety, R4 per maund of 25lb, of the inferior, R2. Wight gives the following formula for the preparation of varnish from the resin:—"Into a new and perfectly clean earthen vessel put one part of Piney Dammar in coarse powder, cover closely, and apply a very gentle heat, until the whole is melted; then add about two parts of linseed oil, nearly boiling hot, and mix well with a wooden spatula. Should the varnish prove too thick, it can, at any time, be reduced by the addition of more oil, or, if required, may be made thicker in the first instance. Close covering, complete liquidation of the resin, and boiling hot oil are absolutely necessary to the success of this process.

The varnish thus prepared would be valuable for coating carriages, furniture, and other work requiring a complete and finely finished protection to the coat of paint. A varnish made with camphorated alcohol, the camphor from which has evaporated, might be used with advantage for varnishing pictures. On the Malabar coast it is made into candles which diffuse an agreeable fragrance, and give a clear light and little smoke. For making these the fluid resin may be either run into moulds or rolled when soft into the required shape. It is said that these candles were at one time introduced into England, but, a very high duty having been imposed, the trade ceased.

In a recent communication to Government, however, the Collector of South Canara states, at the present time no candles are made from the resin. He conjectures that the above description of candles made from the resin may have occurred from confusion of sticks of resin used as incense, and candles made from the tallow. The best pieces of the resin are employed as ornaments, under the name of amber (*Kehroba*) (*Madras Jury Repts.*). In South Canara it is used for caulking boats, and for setting gold ornaments.

Chemistry.
34

CHEMICAL COMPOSITION.—The resin yields, on distillation, 82 per cent. of a volatile oil of agreeable odour, but which does not differ essentially from that obtained from cheaper resins.

OIL.
Seeds.
35

Oil.—The SEEDS contain a large quantity of a solid oil, which may be prepared as follows:—Clean the seeds, then roast and grind them into a mass. To 5 seers seed add 12 seers of water, and boil until the oil rises to the surface. Remove the oil, stir the contents of the vessel, and allow it to stand until the following day, when more oil will be observed on the surface, which may be collected and the process repeated (*Jury Rept., Madras Exhib.*, 1855). The oil is solid even in hot climates, and appears to be well adapted for candle-making. In South Canara it is used for lamps.

for *ghi*, and for medi- OIL.
in the *Journal of the*
a few months previously,
tree, had been brought
commerce by way of Marseilles quantities

ports from
quoted, regarding
The Collector of that district also
oil, which burned well and gave a
being softer and greasier than the
ordinary dip. This fact is at variance with the results of chemical examination. Thus Mr. L. Hooper found the melting point to resemble that of ordinary tallow or wax and

Chemistry. 36

ed by MM. Hoernel and Wolf- hey afforded 49·2 per cent. of a apidly on exposure to light and This fat rapidly saponifies and consists of a mixture of fatty acids melting at 56·6°C. and solidifying at 54·8°C. The mixture contains lid fatty *Chem.*;

be ad- MEDICINE. Resins. 37
it as an
th wax
esinous Oil
pplica- 38
might
the solid
butter (*Pharm. Ind.*).

Structure of the Wood.—Sapwood white with a tinge of red; heartwood grey, rough, moderately hard, porous; weight 41lb per cubic foot. It is not much in request, but is occasionally used for making canoes, the masts of native vessels, and coffins (*Gamble*). TIMBER. 39

VATICA, *Linn.*; *Gen. Pl.*, *I.*, *192, 981.*

[p. 678.

Vatica laccifera, *W. & A.*, see Shorea Talura, *Roxb.*: Vol. VI, Pt. II,

V. lanceæfolia, *Blume*; *Fl. Br. Ind.*, *I.*, *302.* DIPTEROCARPEÆ. 40

Syn.—V. CANACA, *Ham.*; VATERIA LANCEOLARIA, *Roxb.*, V. LANCEÆFOLIA, *Roxb.*; V. LANCEOLATA, *Roxb.*

Vern.—*Morhol*, ASSAM; *Moal*, SYLHET; *Panthitya*, BURM.

References.—*Roxb.*, *Fl. Ind.*, *Ed. C.B.C.*, *435*; *Kurz*, *For. Fl. Burm.*, *I.*, *122*; *Gamble*, *Man. Timb.*, *33*; *Mason*, *Burma & Its People*, *486*, *Gums & Resinous Prod.* (*P. W. Dept. Rep.*), *16, 20*; *Cooke*, *Gums & Resins*, *89*.

Habitat.—A large tree of the Eastern Himálaya, Assam, Eastern Bengal, Chittagong, and Burma.

Resin.—The tree yields a resin, of which very little is known. Roxburgh writes, "From wounds, etc., in the BARK, a clear liquid exudes, RESIN. Bark. 41

RESIN. which soon hardens into a very pure, pale, amber-coloured resin, from which the Natives obtain, by distillation, a dark-coloured, thick, strong-smelling balsam, called *choova*, or *chova*, by the people who prepare and sell it, and *ghoond* by the Brahmins who use it in their religious ceremonies and temples." Mason states that the resin is "precisely similar" to that of **Vateria indica**, a remark which would appear to be supported by Roxburgh's description of its colour and purity.

TIMBER. 42 **Structure of the Wood.**—Heartwood red, rough, hard; weight 35 to 52lb per cubic foot; not very valuable and little used (*Gamble*).

Vatica robusta, *Steud.*, see **Shorea robusta,** *Gærtn. f.*; Vol. VI., Pt. [II., p. 673.

43 **V. Roxburghiana,** *Blume; Fl. Br. Ind., I., 302; Wight, Ic., t. 26.*

Syn.—V. chinensis, *Linn.*; Vateria Roxburghiana, *Wight, Ill., I.,* 88.

Vern.—*Let-louk, lettaub,* Burm.; *Mandora,* Sing.

References.—*Gamble, Man. Timb., 33; Thwaites, En. Cey. Pl., 404; Beddome, Fl. Sylv., t. 95; Mason, Burma & Its People, 515, 757; P. W. Dept. Rept. on Gums & Resins, 32, 35; Cooke, Gums & Resins, 90.*

Habitat.—A tree of the Western Peninsula from Canara southwards, and of Ceylon.

RESIN. 44 **Resin.**—It produces a resin of which little is known, but which is said to resemble those of the preceding species and of **Vateria indica.**

45 **V. scaphula,** *Dyer; Fl. Br. Ind., I., 301.*

Syn.—Hopea scaphula, *Roxb.*

Vern.—*Boilshura,* Beng.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 438; Kurz, For. Fl. Burm., I., 121; Gamble, Man. Timb., 33.*

Habitat.—A large tree found on the Chittagong coast at Mascal island.

TIMBER. 46 **Structure of the Wood.**—Hard but not very durable.

DOMESTIC. Trunk. 47 **Domestic.**—The trunk is made into canoes by the Magh inhabitants of the island on which it is found.

V. Tumbuggaia, *W. & A.*, see **Shorea Tumbuggaia,** *Roxb.*; Vol [VI., Pt. II., p. 67

VENTILAGO, *Gærtn.; Gen. Pl., I., 375.*

48 **Ventilago calyculata,** *Tulasne; Fl. Br. Ind., I., 631;* Rhamne

Syn.—V. denticulata, *Willd.*; V. madraspatana, *Roxb.*; V. rantha, silhetiana, Smithiana, & sulphurea, *Tulasne.*

Vern.—*Rai dhani,* Hind.; *Rúktupita,* Beng.; *Bonga-sarjun, doe-noduár,* Kol.; *Bonga-sarjom,* Santal; *Raktapita, kala lag,* Ku *Kyonti,* Kharwar; *Papri,* C. P.; *Sakal yel,* Mar.; *Yerra c* Tel.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 211; Kurz, For. Fl. I., 263; Brandis, For. Fl., 96; Gamble, Man. Timb., 91; Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 8462; Atkinso Dist., 307; Gazetteers:—Bombay, XV., 430; N.-W. P., IV., lx Ad. Rep. Ch. Nagpur, 1885, 29.*

Habitat.—A large, climbing shrub, found throughout the ho of India, from the Kumáon Himálaya and Nepál, to Bhután, S Burma; also met with throughout the western Peninsula.

FIBRE. Bark. 49 **Fibre.**—Mr. Campbell, who gives all the available economi tion regarding this plant, states that the bark yields a go fibre.

OIL. Seeds. 50 **Oil.**—An oil is obtainedfrom the seeds, which resembles and is used in Chutia Nagpur for cooking purposes (*Campbel*

Medicine.—The JUICE of the BARK and young SHOOTS is, in the same locality, applied to the body as a remedy for the pains which accompany malarial fever. A ring made from the TENDRIL is worn as a charm against toothache (*Campbell*). [*I. 163.*]

MEDICINE. Juice. 51 Bark. 52 Shoots 52 Tendrils 54 55

X, 547.
Habitat.—An extensive climber, found in the Western Peninsula from the Konkan southwards, Burma, and Ceylon.

Gum.—It is said to yield a gum, of which no information is obtainable. GUM. 56

Dye.—The ROOT-BARK is a much valued dye-stuff in Southern India Liotard writes, "At a certain period of the year immense numbers of DYE. Root Bark. 57

with a mordant of alum and myrabolans a darker but fast colour is produced.

Samples of the root-bark were submitted to Mr. Wardle who reported in a beautiful red colouring matter, employed, produce many colours for enerally used The fastness of these rther investigation by me, but still permanent. The dye is well adapted for *tasar* silk, excellent results being obtainable without the employment of extensive processes for bleaching the silk, before the application of the dye." "By some of the methods the colours obtained are e or less nd when ng is the in addi- eddened and deepened by the colouring matter, is produced It is a substance which, no doubt, would be a valuable acquisition to the dye-house, and if quantities could be obtained in India, at the price stated in Surgeon-Major Bidie's report, *viz.*, annas 3-5 per lb, it might be largely used."

DYE. With reference to the last sentence it may be remarked that Lietard gives the price in one passage at 3-5 annas per lb, in another at 2 annas per lb. Moodeen Sheriff states that the wholesale price in Madras is R5 per maund of 25 lb or nearly 4 annas per lb, while the authors of the *Pharmacographia Indica* state that during 1888-89 it was sold by Government agency at R2 for first class, R1-8 for second class, bark per maund (? Madras, of 25 lb); or from 1 to 1¼ annas per lb. Mr. Wardle's remarks regarding the probability of a trade arising are thus likely to be confirmed. The bark is collected in large quantities in the Southern Presidency, especially on the northern slopes of the Nilgiris, and can easily be obtained in Madras. In the *Annual Report of the Madras Forest Department* for 1887-88, it is stated that 3 tons were collected, which realised a revenue of R62, the value of the permits. During 1888-89, 41 maunds of first class, and 66 maunds of second class, bark were collected and sold by Government agency at the prices quoted above (*Pharmacog. Ind.*).

Chemistry. 58 CHEMICAL COMPOSITION.—The colouring matter, extracted by water, is of a red colour and acid slight reaction. It gives violet-red precipitates with plumbic acetate, calcium hydrate, and barium hydrate, a rose-tinted cake with alum and potassic carbonate, and muddy mixtures with ferrous and ferric salts. It is probably one of the derivatives of *anthracene* (*Pharmacog. Ind.*).

FIBRE. Bark. 59 Fibre.—The BARK yields a FIBRE, which is said to be useful for cordage. According to Rumphius the Amboina fishermen use the long climbing

Stems. 60 STEMS instead of rope.

MEDICINE. Root Bark. 61 Medicine.—Moodeen Sheriff states that the powdered ROOT-BARK is carminative, stomachic, tonic, and stimulant; and useful in atonic dyspepsia, debility, and slight cases of fever. He recommends doses of from 30 to 90 grains three or four times in the twenty-four hours, and states that the drug may be employed as a substitute for cascarilla, pimenta, calumba, and cinchona. The powdered bark (mixed with gingelly oil) is also said to be sometimes used in South India as an external application for itch and other skin diseases.

VERATRUM, *Linn.; Gen. Pl., III., 834.*

[LILIACEÆ.

62 **Veratrum viride**, *Aiton.; Baker, in Linn. Soc. Jour., XVII., 471;*

GREEN OR AMERICAN HELLEBORE.

Syn.—HELONIAS VIRIDIS, *Ker*; MELANTHIUM VIRENS, *Thunb.*; M. BRACTEOLARE, *Dav.*

References.—*Pharm. Ind.*, 245; *O'Shaughnessy, Beng. Dispens.*, 657; *Flück. & Hanb., Pharmacog.* 695; *Year-Book Pharm.*—1874, 102; 1875, 219; 1876, 5, 213; 1879, 4, 138; 1880, 208.

Habitat.—Found in the east coast of North America, from Canada to Carolina.

MEDICINE. Rhizome. 63 Medicine.—The RHIZOME, which is official in the Indian and most other modern *Pharmacopœias*, is imported into India in small quantities with other drugs for European use. Its properties are too well known to require comment.

VERBASCUM, *Linn.; Gen. Pl., II., 928.*

[NE...

64 **Verbascum Thapsus**, *Linn.; Fl. Br. Ind., IV., 250;* SCROPHULARI...

Syn.—V. INDICUM, *Wall.*

Vern.—*Gidar tamāku* (=jackal's tobacco), HIND.; *Ylir*, [illegible] *dil*, *phurrik*, *khar ki tam*, *ekbir*, *kadanda*, *phintar*, *kangia*, [illegible]

gosh, kharkharnár, spin kharnár, gúrganna, karáthri, ravand chíni, gidar tamakú, PB.

... given as a febrifuge; the name *rewand chíní* would seem to indicate that it is at times used as an adulterant of or substitute for rhubarb (*Stewart*). The SEEDS are supposed to be narcotic and are used for poisoning fish (*O'Shaughnessy*) Mr. Duthie's Trans-Indus collector states that the HERB is much employed by the Natives of that region for the treatment of asthma and other pulmonary complaints, that it possesses narcotic properties similar to those of tobacco, and that the seeds are considered aphrodisiac. The LEAVES warmed, and rubbed with oil, are employed as an application to inflamed parts. Dr. Watt states that he has known it imported from Europe for medicinal use by an officer resident in Simla. In Europe, and the United States of America, the thick woolly leaves were at one time much valued as demulcents and emollients, not only in domestic medicine, but by practitioners They were used in the treatment of catarrh and diarrhœa, and as an external application for hæmorrhoids. MEDICINE. Root. 65 Seeds. 66 Herb. 67 Leaves. 68

SPECIAL OPINIONS.—§ "Has long been used in Ireland as a remedy in phthisis and phthisical diarrhœa" (*Brigade-Surgeon G. A Watson, Allahabad*). "It is a valuable remedy in phthisis; checks night sweats, relieves cough, and moderates looseness of the bowels. One ounce of the leaves, boiled in a pint of milk, given twice a day, relieves dyspnœa. Highly spoken of by Dr. Grinlan as a palatable and effective remedy" (*Surgeon-Major E G Russel, Asylums, Calcutta*).

Fodder.—It is eaten by camels and goats (*Stewart*). FODDER. 69

VERBENA, *Linn.; Gen. Pl., II., 1146.*

Verbena officinalis, *Linn.; Fl. Br. Ind., IV., 565;* VERBENACEÆ. 70

Syn —V. SPURIA, *Linn.*; V. SORORIA, *DC.*

Vern.—*Pámúkh, karáita*, PB.; *Shamuki*, PUSHTU.

... evil, and for good luck. In Tuscany it is said to be still employed as a poultice for liver complaints, and taken internally for the same disease, and for dropsy. MEDICINE. Leaves. 71 Root. 72

VERNONIA, *Schreb.; Gen. Pl., II., 227.*

[COMPOSITÆ.

Vernonia anthelmintica, *Willd.; Fl. Br. Ind., III., 235;* 73

THE PURPLE FLEA-BANE.

Syn.—SERRATULA ANTHELMINTICA, *Roxb.*; CONYZA ANTHELMINTICA, *Linn.*

NONIA
lmintica.

The Purple Flea-bane.

Vern.—*Sómraj, bákchi, káli-ziri, buckshi, vapchi,* HIND.; *Somráj, bukchie, babchi, bapchie, káli-ziri, hákuch,* BENG.; *Somráj,* URIYA; *Kali-jiri,* KUMAON; *Káli ziri, kálá zira, bukoki, kakshama, malwa bakchi,* PB.; *Kali-ziri, kali-jiri, karvi-ziri, kala-jira,* DECCAN; *Káli-jiri, kalen-jiri,* BOMB.; *Ránácha-jiré, kalenjiri, káralye,* MAR.; *Káli-jiri, kadvo-jiri, kalijiei,* GUZ.; *Káttu-shiragam, kát-siragam, nirnúchie,* TAM.; *Adavi-jilakara, visha-kanta-kálu,* TEL.; *Kádu-jirage,* KAN.-*Káttu-jirakam, kattasiragam,* MALAY.; *Sanni-nácgam, sanni-násang; sanni-nayan.* SING.; *Atavi-jirakaha, kanana-jeraka, somaráji, aval, guja, rákuchi,* SANS.; *Atarilál, itrilál,* ARAB.; *Atarilál, itrilál,* PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C.,* 594; *Dalz. & Gibs., Bomb. Fl.,* 313; *Stewart, Pb. Pl.,* 131; *Sir W. Elliot, Fl. Andhr.,* 11; *Rheede, Hort. Mal., II., t.* 24; *Thesaurus, Zey.,* 210, *t.* 5; *Pharm. Ind.,* 126; *Ainslie, Mat. Ind., II.,* 54; *O'Shaughnessy, Beng. Dispens.,* 419; *Irvine, Mat. Med. Patna,* 128; *Medical Topog., Ajmere,* 128; *Moodeen Sheriff, Supp. Pharm. Ind.,* 254; *U.C. Dutt, Mat. Med. Hind.,* 183, 318; *Murray, Pl. & Drugs, Sind.,* 181; *Dymock, Mat. Med. W. Ind., 2nd Ed.,* 421; *Baroda Durbar, Col. & Ind. Exhb., No.* 182; *Official Corresp. on Proposed New Pharm. Ind.,* 238; *Birdwood, Bomb. Prod.,* 50; *Baden Powell, Pb. Pr.,* 310, 358; *Drury, U. Pl. Ind.,* 441; *Atkinson, Him. Dist.* (*X., N.-W. P. Gaz.*), 311, 753; *Useful Pl. Bomb.* (*XXV., Bomb. Gaz.*), 257; *Cooke, Oils & Oilseeds,* 81; *Bidie, Prod. S. Ind.,* 32; *Gazetteers:—Bombay, VI.,* 15; *N.-W. P., IV.,* lxxii.; *Orissa, II.,* 160; *Mysore & Coorg, I.,* 56; *Agri-Horti. Soc. Ind., Journ.* (*Old Series*), *X.,* 11; *Smith, Econ. Dic.,* 235.

Habitat.—A tall, robust, leafy annual, met with throughout India, to Ceylon and Malacca, ascending to 5,500 feet in the Himálaya and Khásia Mountains.

OIL
Seeds.
74

Oil.—Lieutenant Hawkes states that the SEEDS yield an oil, which is never prepared for sale. It is probably used medicinally.

MEDICINE
Achenes.
75
Seeds
76

Medicine.—The ACHENES are highly reputed in Sanskrit medicine as a remedy for white leprosy (leucoderma) and other skin diseases. They are mentioned also as an anthelmintic, but are little used as such, except in combination with other drugs. In chronic skin diseases the SEEDS are taken alone or in combination with other medicines. In the severer forms, such as psoriasis and lepra, the remedy is recommended to be taken daily for one year, when a complete cure is said to be effected. Chakradatta describes several elaborate combinations for external and internal use. The former are oils and pastes; one of the latter, a decoction of the powdered seeds and sesamum in tepid water, is directed to be taken after perspiration has been induced by exercise or exposure to the sun. The diet prescribed is milk and rice (*U. C. Dutt*). The author of the *Makhsan-el-Adwiya* ascribes the drug as given internally to remove phlegm and worms from the intestine, and states that a poultice or plaster made of it is employed to disperse cold tumours. But, he remarks, it is not often prescribed as an internal medicine, as it is thought to have injurious effects, though it is frequently used as a drug for cattle (*Dymock*).

The medicine early attracted the attention of European writers on medicine in India Rheede wrote that an infusion was given, on the Malabar coast, as a remedy for coughs and flatulency. Ainslie wrote that the seeds were reckoned a powerful anthelmintic, and also formed an ingredient of a compound powder prescribed in cases of snake-bite. O'Shaughnessy, Taylor, Irvine, and others notice the vermifuge properties of the seeds, but say little as to their opinion of their value. Stewart states that in the Panjáb they are given in anasarca, and used to make plasters for abscesses. Baden Powell writes that in the same province they are believed to possess most of the properties above noticed, and are also considered febrifuge, and a "valuable remedy for prolonging life, restoring youth, and preventing the hair turning grey." The plant is included in

the secondary list of the *Indian Pharmacopœia*, where the seeds are said to enjoy a special reputation as an anthelmintic in cases of ascarides lumbricoides (round worms), which, under their use, are said to be expelled in a lifeless state, thus showing that the drug exercises a specific effect on the entozoa The ordinary dose is about 1½ drachm, given in two equal doses at the interval of a few hours, and followed by an aperient Dr. Æ. Ross is quoted as recommending the drug as a vermifuge, given in doses of 10 to 30 grains, powdered, while Dr. Gibson, as the result of personal experience, is said to regard it as a valuable tonic and stomachic, in doses of 20 to 25 grains Diuretic properties have also been assigned to it In Travancore, the bruised seeds, ground up in a paste with lime-juice, are largely employed as a means of destroying pediculi. (*Pharm. Ind*) MEDICINE.

SPECIAL OPINIONS.—§ "In some cases I have used the seeds as an anthelmintic, but with unsatisfactory results The administration was usually followed by a dose of castor-oil the following morning. Preparation—Powdered seeds and infusion. Dose: 30 grains twice a day, either in powder or infusion" (*Apothecary J. G. Ashworth, Kumbakonam, Madras*). "Seeds—tonic, stomachic, anthelmintic Dose: 60 to 120 grains anthelmintic, 10 to 30 grains tonic" (*Apothecary Thomas Ward, Madanapalla, Allahabad*). "Four ounces fine powder seed, ⅛ qt rum, ⅛ qt water, put out in the sun for ten to twelve days. Dose, a wineglassful at 5 A M., after which patient is to lie on his side for half an hour. This prescription was given to me as a specific for spleen by a tea-planter, who professed to have never failed with it after trial in many cases. In my hands in hospital patients, it proved, like most specifics, useless (*Surgeon-Major, E Sanders, Chittagong*).

Domestic.—The SEEDS, as already stated, are employed to destroy pediculi in the head and body, and may possess some antiseptic powers The PLANT roasted in a room, or powdered and thrown about the floor, is believed to expel fleas—hence the popular English name. DOMESTIC Seeds. 77 Plant 78

Vernonia cinerea, *Less; Fl. Br Ind., III., 233; Wight, Ic., t. 1076.* 79

THE ASH COLOURED FLEA BANE.

Syn.—V. CONYZOIDES, *DC*; V. RHOMBOIDEA & MONTANA, *Edgew*, V ALBICANS, *DC*, V. ABBREVIATA & LEPTOPHYLLA, *DC*; V. LAXIFLORA, *Less.*; V PHYSALIFOLIA, *DC*; CONYZA ABBREVIATA, BELLIDIFOLIA, CINERASCENS, INCANA, LINIFOLIA, ELEGANTULA, OVATA, & SUBSIMPLEX, *Wall.*, C. CINEREA, *Linn.*, C. MOLLIS, *Willd*, C PROLIFERA & HETEROPHYLLA, *Lamk*, SERRATULA CINEREA, *Roxb*, CACALIA ROTUNDIFOLIA, *Willd.*

Vern.—*Kúksim, kúkshim, kala-jira,* BENG.; *Barangom, bahu tuturi, birlopong arak', jhurjhuri, duryaarak',* SANTAL; *Sahadevi,* PB.; *Lalia, kali harr,* MERWARA; *Sira-shengalanir,* TAM.; *Garits kamma,* TEL., *Monera-kúdimbeya,* SING., *Sahadevi,* SANS.

References.—*Thwaites, En. Ceyl. Pl, 160, Dalz. & Gibs, Bomb. Fl., 121, Rev. A. Campbell, Rept. Ec. Pl Chutia Nagpur, Nos 7874, 7877, 8452 8744, 9862; Elliot, Fl. Andhr., 58; Rheede, Hort Mal., X., t 64, Burm, Thes. Zeyl., t. 96, f. 1; Ainslie, Mat. Ind, II, 363; Irvine, Mat. Med. Patna, 45; Dymock, Mat. Med. W. Ind., 2nd Ed, 423; Drury, U. Pl. Ind, 442; Atkinson, Him. Dist, 311, Gazetteers:—Mysore & Coorg, I., 62; Bombay, V., 26, N.-W. P., I, 81, 82, Agri.-Horti. Soc. Ind., Journ. (Old Series), X., 11; Ind. Forester, XII., App., 2, 15.*

Habitat.—One of the commonest Indian weeds, found throughout India, ascending to 8,000 feet in the Himálaya, Khasia mountains, and hills of the Peninsula.

Medicine.—Ainslie states that the whole PLANT, with its small, round, downy, tasteless flowers, is used in medicine by the Hindus, in decoction, to promote perspiration in febrile affections. Irvine writes that the SEED is MEDICINE. Plant. 80 Seed. 81

employed in Patna as an alexipharmic and anthelmintic, and as a constituent of *masálas* for horses. In Chutia Nagpur the whole plant is given as a remedy for spasm of the bladder and strangury; the FLOWERS are

MEDICINE. Flowers. 82 administered for "blood-shot eyes"? conjunctivitis (*Campbell*). The latter use is interesting, since, according to Piso, the leaves of another species of the same genus are similarly employed in Jamaica.

This plant appears to be esteemed as a medicine by the Hindus of the Eastern Provinces; in Bombay, Dymock informs us, it is not utilised, and no writer on Northern India makes any mention of it.

FOOD. Leaves. 83 **Food.**—The LEAVES are eaten as a pot-herb in Chutia Nagpur (*Campbell*).

VERONICA, *Linn.; Gen. Pl., II., 964.*

84 **Veronica beccabunga,** *Linn.; Fl. Br. Ind., IV., 293;* SCROPHULARINEÆ.

References.—*Stewart, Pb. Pl., 163; O'Shaughnessy, Beng. Dispens., 478; Year-Book Pharm., 1874, 134, 628; Atkinson, Him. Dist., 314; Agri.-Horti. Soc. Ind., Journ. (Old Series), XIV., 52.*

Habitat.—A herb, met with in the Western Himálaya, from Kashmír to Kanáwar, and in Western Tibet, at altitudes from 9,000 to 12,000 feet.

MEDICINE. Plant. 85 Leaves. 86 Stems. 87 **Medicine.**—Honigberger states that the PLANT is used medicinally in Kashmír. In Europe and America, the LEAVES and young tender STEMS were formerly much valued as an antiscorbutic; the former are still occasionally employed as a styptic to wounds, and, when bruised, they are applied to burns (*Stewart*).

VIBURNUM, *Linn.; Gen. Pl., II., 3.*

88 **Viburnum coriaceum,** *Blume; Fl. Br. Ind., III., 5;* CAPRIFOLIACEÆ.

Syn.—V. CYLINDRICUM, *Ham.*

Var. capitellata, *Wight, Ic., t. 1022, (sp.)*=V. HEBANTHUM, *Thw. (in part, not of W. & A.)*

Var.—ZEYLANICA, *Thw. (in part)*=V. CORIACEUM, *var.* β, *H. f. & T.*

Vern.—*Kala titmaliya,* KUMAON; *Bara gorakuri,* NEPAL.

References.—*Brandis, For. Fl., 259; Gamble, Man. Timb., 214; Atkinson, Him. Dist., 311; Ind. Forester, II., 23; V., 183, 184; VIII., 408, 412.*

Habitat.—A large shrub or small tree, common on the Himálaya from the Panjáb to Bhutan, at altitudes of 4,000 to 8,000 feet; also found in the Khásia Hills, the Nilgiris, and Ceylon.

OIL. Seed. 89 **Oil.**—It is said that the Nepalese extract, from the SEED, an oil, which they use for food and for burning (*Gamble*).

TIMBER. 90 **Structure of the Wood.**—Similar to that of **V. cotinifolium**; weight 50lb per cubic foot.

91 **V. cotinifolium,** *Don; Fl. Br. Ind., III., 3; Wight, Ill., t. 121.*

Syn.—V. POLYCARPUM, *Wall.*

Vern.—*Gwia, guya,* KUMAON; *Richh úklú, bankún-h, richhábi kilmích, gúch, bathor, pápat kalam, khimor, rájab, túmma, kálonda, jáwa, khatip, tústús, sússú, marghwalawa,* PB.; *Marghwalwa,* PUSHTU.

References.—*Brandis, For. Fl., 258; Gamble, Man. Timb., 214; Stewart, Pb. Pl., 114; Atkinson, Him. Dist., 311; Gazetteers:—Bannu, 23; Déra Ismail Khán, 19; Ind. Forester, XIII., 68; Agri.-Horti. Soc. Ind., Journ. (Old Series), XIV., 16.*

Habitat.—A large deciduous shrub, met with in the Sulaiman Range, common on the North-West Himálaya from Kashmír to Kumáon and East Bhután between 4,000 and 11,000 feet.

Food —Produces a FRUIT which, when ripe, is sweetish, and is eaten in many places by the Natives.

FOOD Fruit. 92

Structure of the Wood —White, hard to very hard, close-grained. TIMBER 93

Vibernum erubescens, *Wall.; Fl. Br. Ind., III., 7; Wight, Ic.*, [*t. 1024.* 94

Syn.—V. WIGHTIANUM, *Wall.*, V. PUBIGERUM, *W. & A.*

Vern.—*Ganné, asari*, NEPAL; *Kancha*, LEPCHA; *Nakouli, damshing*, BHUTIA.

References.—*Brandis, For. Fl., 258; Thwaites, En Ceyl. Pl., 136; Beddome, Fl. Sylv., t. 124, Gamble, Man. Timb., 215, Ind Forester, II, 23.*

Habitat.—A large shrub or small tree, common on the Himálaya from Kumáon to Bhután, between 5,000 and 11,000 feet, also found in the Nilgiris and Ceylon

Structure of the Wood.—Very hard, reddish, close and even-grained; weight 59lb per cubic foot. It might be used as a substitute for boxwood and for carving, and is employed for making house-posts in Sikkim. TIMBER. 95

V. fœtens, *Dcne.; Fl. Br. Ind., III, 8.* 96

Vern.—*Gúch, úklú, kúnch, kilmich, kwillim, kulára, jamára, tilhanj, tianlandhd, púlmú, tilats, fúm, talhang, tandei, túndhe, tunanisenani, talhang, thelain, tselain, thilkain*, PB.; *Guya*, KUMAON.

References.—*Kurz, For Fl. Burm., II., 2, Brandis, For. Fl., 259, Gamble, Man. Timb., 215, Stewart, Pb Pl., 114, Baden Powell, Pb. Pr., 601, Agri.-Horti Soc. Ind, Journ. (Old Series), XIV., 13*

Habitat.—A large shrub of the North-West Himálaya, from 5,000 to 11,000 feet. The flowers have a delicious scent, the name being derived from the fœtid odour emitted when the branches are bruised

Food —The FRUIT is sweetish, when ripe, and is eaten by the Natives. FOOD. Fruit. 97

Structure of the Wood —White, hard to very hard, close-grained, similar in appearance and structure to that of V. cotinifolium, weight 53lb per cubic foot. It is chiefly utilised for firewood. Timber. 98

V. fœtidum, *Wall.; Fl. Br. Ind., III., 4* 99

Vern.—*Nárwel*, BOMB.

References.—*Kurz, For. Fl. Burm, II., 2; Dymock, Mat. Med W Ind, 2nd Ed., 603.*

Habitat.—Common at altitudes from 3,000 to 5,000 feet in Assam, the Khásia Mountains, and Burma; cultivated in gardens in other parts of India

Medicine —Dymock gives an interesting acc... ...e medicinal uses of this shrub as follows:—"This ... not a native of Western India, but ... green parts emit a ... ...du women who ... ...hich they lie, as ... ...age Another ...us of grain ...ious glands. ...icked by a virgin ... of this plant are knotted into ... A cake made from the flour of eighteen ...oistened with narwél JUICE, is scraped on one side while hot, well ...lassful of the juice and applied to the head in headache. A wine... ...agia daily, also in post-partum hæmorrhage. It is remarkable that ... primifolium, an American plant, has also been found useful in all ...erine diseases characterised by loss of blood and in threatened abortion." (...at. Med W. Ind.).

MEDICINE.

Branch. 100

Stem. 101

Juice. 102

Leaves. 103

104 **Viburnum nervosum**, *Don; Fl. Br. Ind., III., 8.*

Syn.—V. GRANDIFLORUM, *Wall.*

Vern.—*Amrola, ámbre, ári, ris, dáb, thilkain, thalein*, PB.

References.—*Brandis, For. Fl., 259; Stewart, Pb. Pl., 115; Atkinson, Him. Dist., 311.*

Habitat.—A large shrub or gnarled small tree, found on the Himálaya, from Kashmír to Sikkim, between altitudes of 10,000 and 13,000 feet; not common.

FOOD. Fruit. 105 Food.—It produces a pretty red FRUIT, which is eaten by the Natives of the locality in which it grows.

106 **V. stellulatum**, *Wall.; Fl. Br. Ind., III., 4.*

Syn.—V. MULLAH, *Ham.*

Vern.—*Lál tit-maliya*, KUMAON; *Amliácha, phulsel*, KASHMIR; *Jal bágú, eri, ira*, PB.

References.—*Brandis, For. Fl., 258, 576; Gamble, Man. Timb., 214; Stewart, Pb. Pl., 115; Atkinson, Him. Dist., 311; Ec. Prod., N.-W. P., Pt. V., 44, 76.*

Habitat.—A shrub of the North-West Himálaya from 6,000 to 10,000 feet.

FOOD. Fruit. 107 Food.—The FRUIT, though sour, is eaten by Natives.

VICIA, *Linn.; Gen. Pl., I., 524.*

108 **Vicia Faba**, *Linn.; Fl. Br. Ind., II., 179*; LEGUMINOSÆ.

THE GARDEN BEAN.

Syn.—FABA VULGARIS, *Mœnch.*

Vern.—*Bakla, anhuri*, HIND.; *Nákshan, nakhthan*, LAD.; *Bákla*, KUMAON; *Káiún*, KASHMIR; *Chastang raiún*, N.-W. HIMALAYA; *Chás tang, bakla, kábli bakla, sein, matts-rewari*, PB.; *Ful*, EGYPT.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 566; DC., Orig. Cult. Pl., 316; Stewart, Pb. Pl., 69; Murray, Pl. & Drugs, Sind, 121; Birdwood, Bomb. Pr., 123; Baden Powell, Pb. Pr., 242; Atkinson, Him. Dist., 694; Church, Food-Grains, Ind., 131; Smith, Econ. Dict., 43; Settle. Rept., Kángra, 24; Gazetteers:—Mysore & Coorg, I., 59; N.-W. P., IV., lxxi.; Panjáb, Kángra, 152; Firminger, Man. Garden. Ind., 150; Ind. Forester, IX., 452; Rept. from Govt. of Burma.*

Habitat.—According to DeCandolle the wild habitat of the Garden Bean was probably two-fold some thousands of years ago, one of the centres being to the south of the Caspian, the other in the north of Africa. "The nature of the plant," he writes, "is in favour of this hypothesis, for its seed has no means of dispersing itself, and the rodents or other animals can easily make prey of it. Its area in Western Asia was probably less limited at one time, and that in Africa, in Pliny's day, was more or less extensive. The struggle for existence which was going against this plant as against maize, would have gradually isolated it, and caused it to disappear if man had not saved it by cultivation." He brings many arguments to bear which prove that the bean was cultivated in Europe in prehistoric times. It was introduced into Europe probably by the Western Aryans at the time of their earliest migrations (*Pelasgians, Kelts, Slavs*); and was taken to China later, a century before the Christian era, still later to Japan, and quite recently into India (*Origin Cult. Pl.*). The last statement is probably true only of the plains. It is based on the want of evidence of ancient cultivation, together with the fact that there is "no Sanskrit name, nor even any modern Indian name." But it will be seen from the above list, that several names *do* exist, in Kashmír, Ladák, the Panjáb, and the North-West plains, and it is significant that Stewart wrote some twenty years ago, "Probably not grown in the plains except by Euro-

peans, but *commonly* cultivated in Kashmír, 5,000, and Kanáwar, Spiti, and Tibet, 8,000 to 12,000 feet." It would from these facts seem to be not

CULTIVATION 109

plains here and there in European gardens, or for European consumption, but is only grown to any considerable extent in the North-West Provinces

should be put in the ground 2 inches deep, in rows of double drills 4 inches apart, a space of 2 feet being left between each row When the plants come into full blossom about an inch should be nipped off the top of each.

No information can be given as to the extent of cultivation in the North-West Provinces A recent communication from the Government

FOOD. Pod. 110 Seed 111

times the beans are ground into flour for food, and are also sometimes given to cattle. According to Church, Indian seed contains about 25 per cent. of albumenoids, and 7 5 per cent. of fibre

Vicia hirsuta, *Koch; Fl. Br. Ind., II, 177.* 112
THE HAIRY TARE.

Habitat.—An herb of the North-West Provinces, Panjáb, and Nepal up to 6,000 feet, also of the Nilgiris Roxburgh says it is a native of Bengal. Frequently met with in cultivated grounds during the cold season.

Fodder.—In the inland provinces it is sometimes cultivated for fodder. FODDER. 113

V. sativa, *Linn.; Fl. Br. Ind., 178.* 114
THE COMMON VETCH, or TARE

Var. angostifolia, *Roth.* (*sp.*)=V. BOBARTII, *Forst.*; V. PALLIDA, *Jacquem.*

Vern.—*Akra, ankra,* HIND.; *Ankari,* BENG.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 566; DeCandolle, Origin Cult. Pl., 108; Stewart, Bot. Tour in Hazára, in Agri.-Horti. Soc. Journ. (Old Series), XIV., 19; Agri.-Horti. Soc. Ind., Journ. (Old Series), II., Sel., 174, 175; IX., 416; (New Series), II., Pro., 1870, 30, 31; Gazetteers, N.-W. P., IV., lxxi.; X., 308; Saidapet Exp. Farm Rept., 1877, 16.*

Habitat.—This annual leguminous herb exists wild throughout Europe, except in Lapland. Roxburgh pronounces it to be wild in Bengal and the North-West Provinces, but Baker, in the *Fl. Br. Ind.*, admits this only as far as the variety angustifolia is concerned. There is, however, no evidence of the plants being cultivated in India; if not truly wild, the seed must probably have been introduced with that of some European cereal which happened to contain it as an impurity. Roxburgh states that it is "seldom or never cultivated in Bengal," and no writer mentions it as a cultivated crop in any part of the country. In 1877 attempts were made at the Madras Experimental Farm to introduce it, but without success. The seed germinated well, but the young plants could not withstand the heat.

FODDER. Plant. 115

Fodder.—Cattle browse the PLANT, wherever it occurs as a weed of, or near, cultivation.

VIGNA, *Savi; Gen. Pl., I., 539.*

116 Vigna Catiang, *Endl.; Fl. Br. Ind., II., 205;* LEGUMINOSÆ.

THE CHOWLEE OF INDIA and TOW COK OF CHINA.

Syn.—DOLICHOS CATIANG, *Linn.*; D. SINENSIS, *Linn.*; VIGNA SINENSIS, *Endl.*; DOLICHOS TRANQUEBARICUS, *Jacq.*; D. MONACHALIS, *Brot.*

Vern.—*Lobiá, chowli, rianish, rawás, rausa, souta, bora,* HIND.; *Barbati, ramhikolai, shim* or *chim,* BENG.; *Ghangra,* SANTAL; *Urohi mahorpat,* ASSAM; *Barbutiti,* C. P.; *Lobiá, rawas, rausa, souta,* KUMAON; N.-W. P. & OUDH; *Lobiya riánsh, ráish, riensh, souta, Lobiyá, rawán, souta, harwánh chota, rawangan, raongi, rawángi, ró-in,* PB.; *Chaunro,* SIND; *Lobeh, chowli,* DEC.; *Chola, chowli, safed lobeh, hurrea, lobeh, gatwal,* BOMB.; *Chaoli,* MAR.; *Chora, chola,* GUZ.; *Caramunny-pyre,* TAM.; *Boberlú, alusundi, duntú-pesalú, bobra,* TEL.; *Tadagunny, kursan-pyro, alasandi,* KAN.; *Alasendi,* MALAY; *Li-mæ,* SING.; *Rájamásha, nishpáva,* SANS.; *Lobiya,* PERS.

For a discussion on some of the above vernacular names, see the article on Dolichos Lablab, *Linn.*; Vol. III., 184-186.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 559, 560; Stewart, Pb. Pl., 67; U. C. Dutt, Mat. Med. Hindu, 312, 315; Birdwood, Bomb. Prod., 118; Baden Powell, Pb. Pr., 241, 341; Drury, U. Pl. Ind., 186; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 309, 695; Duthie & Fuller, Field and Garden Crops, Pt. II., 12; Useful Pl. Bomb. XXV., (Bomb. Gaz.), 153, 341; Stewart, Food of the Bijnour Dist., 474; McCann, Dyes & Tans, Beng., 156; Church, Food-Grains, Ind., 156; Darrah, Note on Cotton, 35; Stock's Rep. on Sind,; Rept. on Kumaon by Madden, 279; Bombay, Man. Rev. Accts., 101; Settlement Report:—N.-W. P. Kumaon, app. 32; Central Provinces, Upper Godavery, 36; Rept., Dir. Agric. Dept. Beng., 1886, lxxiii.; Rep. on Land Rec. and Agriculture, Bombay, App. viii.; Gazetteers:—Bombay, VIII., 182, 189; N.-W. P., III., 225; IV., lxxi.; Eta, 27, 30; Mysore & Coorg, II., 11; Agri.-Horti. Soc. Ind., Journ. (Old Series), IV., 213, 214; IX., Sel., 58; Ind. Forester, IX., 203.*

Habitat.—Native, but also cultivated in the hotter parts of India.

Cultivation 117

CULTIVATION.—This crop is, as a rule, grown for its grain, and, like many others, forms an associate of the *kharif* millets. Several races exist, which

CULTIVATION.

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Panjab. 118

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N.-W. Provinces. 119

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mach The leaves and stems are used as cattle fodder" (*Duthie & Fuller*).

Madras. 120

Madras.—The crop is a fairly important one in this Presidency, and in 1888-89 occupied an area of 33,433 acres During the last ten years the

Bombay & Sind. 121

Bengal. 122

DYE. Leaves. 123

CULTIVATION. Then place in a mortar *urohi* leaves four parts, turmeric one part, and *thulura* leaves two parts; crush the whole well, and after rubbing the pulp so formed well into the cloth, dyed as above in *rúm*, leave the whole, cloth and pulp, to steep for the night. Next morning squeeze the juice out of the material, and dry in the sun. The process should be repeated till the desired shade of green has been obtained. The leaves of the plum-tree are said to answer as well as those of *urohi maibrpat*. There is another method of producing the dye, in which lime-water is used instead of ash-water, the rest of the process being identical with that described above" (*Darrah, Note on Cotton in Assam*). According to one account the latter part of the process alone is sufficient to dye previously uncoloured cloth a green colour. But this is probably incorrect; since from Mr. Darrah's careful account it may be presumed that the blue produced by the substitute for indigo, *rúm*, is converted by the second process, which of itself colours yellow to green. It is impossible to say how much of the yellow colour is due to the turmeric, and how much to the leaves of the *urohi*, but there is certainly no reason to believe that the latter will, by themselves, produce a green dye (*Cf.* Vol. IV., 451-455).

MEDICINE. Seeds. 124 **Medicine.**—In the Panjáb the SEEDS are considered "hot and dry, diuretic and difficult of digestion. They are used in special diseases, and to strengthen the stomach" (*Baden Powell*).

FOOD & FODDER. Grain. 125 Pods. 126 Stalks. 127 Leaves. 128 129 **Food & Fodder.**—The GRAIN is eaten either as flour, or split, as *dál*. It is considered less wholesome than that of *urd* or *múng* (see Phaseolus), and white seeds are reckoned the best. The green PODS, especially of the long-podded form, are plucked while young, boiled and eaten as a vegetable. The STALKS and LEAVES are used as fodder. One hundred parts of the husked bean contains, water, 12·5 parts; albuminoids, 24·1; starch, 56·8; oil, 1·3; fibre, 1·8; and ash, 3·5, of which 1·0 consists of phosphoric acid (*Church*).

Vigna pilosa, *Baker; Fl. Br. Ind., II., 207.*

Syn.—Dolichos pilosus, *Roxb.*; Phaseolus difformis, *Wall.*

Vern.—*Jhilirdi, kalli, malaimia*, Beng.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 567; Agri-Horti. Soc. Ind. Journ. (Old Series), IV., 213, 214.*

Habitat.—A rare species, found in the Eastern Tropical Himálaya, Bengal, Western Peninsula, Orissa, and Prome.

FOOD & FODDER. Grain. 130 **Food & Fodder.**—The GRAIN is eaten as *dál* by Natives; the STRAW is eaten by cattle.

Villarsia cristata, *Spreng.*, see Limnanthemum cristatum, *Griseb.*; [Vol. IV., 641.

V. nymphæoides, *Vent.*, see Limnanthemum nymphæoides, *Link.*; [Vol. IV., 641.

VILLEBRUNEA, *Gaud.; Gen. Pl., III., 390.*

131 **Villebrunea frutescens**, *Bl.; Fl. Br. Ind., V., 590;* URTICACEÆ.

Syn.—Morocarpus microcephalus, *Benth.*; Urtica frutescens, *Roxb.*

Vern.—*Gar tashiara, poidhaula, kagshi, phusar-patta*, Kumaon; *Kirma*, Nepal; *Takbret*, Lepcha. This seems also to be the *mesaki* fibre of many writers on the resources of the Panjáb.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 656; Brandis, For. Fl., 406; Gamble, Man. Timb., 325; Atkinson, Him. Dist., 317, 798; Royle, Fib. Pl., 365; Jour. Agri-Horti. Soc. Ind., VII. (Old Series), 217; Watt, Sel. from Rec., Govt. of India, R. & A. Dept., I. (1889), 315.*

Habitat.—A small tree of the Tropical Himálaya from Kumáon eastwards, ascending to 5,000 feet in Sikkim; also found in the Khasia Hills at Shillong.

Fibre.—See V. integrifolia, *Gaud.* FIBRE 132

Villebrunea integrifolia, *Gaud.; Fl. Br. Ind., V., 589.* 133

Syn.—V APPANDICULATA, *Wedd.*, OREOCNIDE ACUMINATA, *Kurz*, URTICA APPENDICULATA, *Wall*, CELTIS ELONGATA & TETRANDRA, *Wall*

Var. sylvatica=V. SYLVATICA, *Blume*, BŒHMERIA SYLVATICA, *Hassk*, OREOCNIDE SYLVATICA, *Miquel* 134

Vern.—*Lipic, lipiah*, NEPAL; *Ban rhea*, ASS.

References.—*Roxb, Fl Ind, Ed. C B C., 657, Gamble, Man Timb, 325, Kurz, For Fl, Burma, II., 427, Journ Agri-Hort Soc Ind (Old Series), VI, 184; VII., 222; Cross, Bevan, & King, Report on Indian Fibres, 34, Watt, in Sel. from Rec., Govt. of Ind., R & A Dept., I, 315.*

Habitat.—A small tree or large bush, met with in the Eastern Himálaya, Assam, the Khásia Hills, Sylhet, Burma, Munipore, and Chittagong; according to Stocks it also occurs in the Deccan Peninsula from the Konkan southwards The variety sylvatica occurs in Sikkim, Assam, Burma, the Andaman islands, the Western Ghats, and Ceylon.

Fibre.—Dr. Watt has recently written an exhaustive account of the fibre of this and the preceding species (*Sel from Rec. Govt of India, l. c.*), which, as containing all the information obtainable on the subject, may be given in full:— FIBRE. 135

"Both V integrifolia and V frutescens are reputed to yield highly valuable fibres, and it is probably the case that they are of equal merit At all events, the two plants are very nearly allied, and when both occur in the same locality are most probably not separately recognised by the Natives. The former is if anything a more tropical plant and prefers the damper eastern tracts of the Himálaya, whereas the latter takes the place of that species in the drier areas, and is distributed as far to the northwest as the basin of the Upper Sutlej. Gamble describes the fibre as 'brown in colour, strong and flexible, is made in Sikkim and Assam, into ropes, nets, and coarse cloth. The tree is of quick growth and coppices easily, and the fibre is likely to prove valuable', Kurz makes a much more startling statement. 'This is the *ban-rhea* of the Assamese, which yields the fibre called China-grass cloth.' *Spons' Encyclopædia* publishes a fact of the greatest importance (p. 932); speaking of Villebrunea integrifolia, the writer of that article says: 'The fibre is more easily separated than that of the preceding (Maoutia Puya), and is considered one of the strongest in India.'

"Royle throughout the whole of his admirable Chapter on Rhea (*Fibrous Plants of India*) alludes repeatedly to *Bon Rheea* or 'Wild Rhea.' In a special report on 'Rhea Fibres in Assam and Hemp in the Himálaya', submitted to the Board of Directors of the Honourable East India Company in 1853, Royle urges that every effort should be made to develop a trade in (*a*) the *Kunkhura* of Rungpore, Dinagepore, etc., which he says is also the *Pan* of the Shan States, and in (*b*) the *Bon Rhea* of Assam. The writer has read all the passages descriptive of the latter with the greatest care, so as to avoid, as far as possible, raising false hopes, through falling into mistakes regarding the remarkable fibre Royle designates as *Bon Rheea*. Compiling from the writings of others must necessarily be a less satisfactory procedure than reporting the results of original experiments, such as those performed by Roxburgh or by Royle. The possibility of falling into misinterpretations meets one on

FIBRE.

every hand, and the feeling of uncertainty is only equalled by the consciousness that we have no modern authorities from whom information can be culled that for a moment could be compared with those who wrote the greater part of a century ago. (Roxburgh's experiments with Rhea, for example, were performed in 1805.) The necessity for care, in deciding what Royle meant by *Bon Rheea*, will be at once apparent from the following table as given by the author of the *Fibrous Plants of India*, the more so since he remarks 'the specimens were very carefully prepared by George Aston, and their strength tried in the office of the Military Store.'

	Broke with a weight in lb of
Petersburgh Clean Hemp	160
Yercum (Calotropis gigantea)	190
China-grass, from China	250
Rhea fibre or China-grass from Assam	320
Wild Rhea, also from Assam	343

Hemp from Kote Kangra bore 400 without breaking.

" Now, according to this result, the *Bon-rhea* of Assam is a stronger fibre than either Rhea or China-grass. Turning to Royle's work to discover the source of this fibre, there would appear to be little room for doubt that the *bon-rhea* fibre he experimented with was obtained from Villebrunea integrifolia. The following account of his *bon-rhea* may be reproduced entire (p. 363):—

"'In the preceding observations, the *Bon* or *Bun Rhea*,—that is, Jungle Rhea,—is so called as if it were the Dom Rhea or China Nettle in a wild state. Of this there is no proof, but considerable probability that it is a distinct species, possessed of many of the same properties as the Ramee or Rhea Nettle. Indeed, Major Hannay, who has chiefly brought it into notice, says of Bon or Jungle Rhea (Bœhmeria species) that it is a Jungle plant, common in the Assam forests, and thriving best in the vicinity of water or of running streams. When unmolested it grows to a tree, but, by proper management, any quantity of young shoots can be obtained; and as the divided roots afford numerous shoots, the plant can be propagated by slips as well as by the seed. Its cultivation for its fibre might be carried on as with the willow in Europe.

"'By the Chinese in Assam, it is said to be exported into Southern from Northern China. It is cultivated largely by the hill tribes north-west of Yunnan, and by the Singpoos and Dhonncas of our own north-eastern frontier, to a small extent only, for a coarse cloth, but chiefly for nets. The Nepaulese recognise it as the *Leepeeah* of Nepaul.'

"This fibre, in the state in which it has been sent, is well adapted for rope-making. It is about five feet in length, brown in colour, strong and flexible. Capt. W. Thompson, of the house of Messrs. Thompson, Rope-makers, of Calcutta, says of it: 'It is all that can be desired either for canvas or lines, and only requires to be known to be generally used for such purposes.' It was this fibre which was made into a 5-inch rope by Messrs. Huddart along with the Dom Rhea or China-grass, and broke with a weight of about nine tons, or precisely 21,025lb. Since then, it has been made up into ropes of various sizes, which have been carefully tested, and found in every case greatly to exceed in tenacity those made of Russian hemp of the same size. (Here a reference is given to the table of results which has been reproduced above.) 'It has been also made up into lines and cords, some of them almost fine enough for fishing-lines: in all which it displays its fitness for all such purposes from the union of strength and flexibility.' This is almost word for word Major Hannay's description

or the "Ban-rhea" (*J. Murray.*) VILLEBRUNEA integrifolia.

FIBRE.

[*Jour. Agri-Hort, Soc., VII. (Old Series), p 222*], and further on that writer alludes to the *Mesakhee* fibre which he says is obtained from a plant very similar to the *Bon-rhea*. This would thus appear to be Villebrunea frutescens

"At page 373 of his work Royle gives the following table:—

Fibre.	Size of rope.	Total No of yarns	Strength of rope in lb.
Wild rhea, 1st experiment	$4\frac{7}{8}$	132	19,032
Ditto, 2nd experiment	$4\frac{7}{8}$	132	21,025
Rhea fibre	$4\frac{7}{8}$	132	20,488

It grows
: *lipiah* in
scription of
f Maoutia,
and Royle's information was not compiled in London from numerous sources it was directly taken from the writings of Major Hannay, a

China-grass from Northern ...
the China-grass from the south, the Rhea or Ramie, of India and of the Straits.

"Be that as it may, we have remained too long ignorant of the properties of the fibres allied to the Rhea of commerce. If all Royle has said, nay, even if half what he has said of this fibre be correct, the future may be expected to largely displace Rhea by the neglected *Ban-rhea* of Assam. That plant could be much easier cultivated than Rhea or China grass,

cultivation along canal courses ...
however, were the plant found unsuited to the plains, its cultivation could be extended throughout the Himálayas and on all the mountain ranges of India, more especially in Assam, Burma, and on the Western India ...

as cited above, we have the authority of one ...

FIBRE.

cold it is macerated [being beaten] with a mallet on a flat stone while cold water is applied. The woody matter gradually disappears, leaving a fine fibre which is admirably adapted for fishing lines and nets as well for its great strength as for its powers of resisting moisture."

Dr. Watt continues, "Modern experiments with Villebrunea fibre cannot, however, be discovered. No authentic samples of the fibre were shown at the Colonial and Indian Exhibition. The old delusion apparently prevailed so strongly, with the gentlemen who made the fibre collections, namely, that Rhea and *Ban-rhea* (=wild rhea) were essentially species of Bœhmeria, and hence no trustworthy collections of the fibres from the allied Rhea plants were furnished. And that not because they were unobtainable, but rather in consequence of undue attention having been given to the species of Bœhmeria.

"The writer cannot, therefore, commend in too strong terms the Villebrunea fibres to the attention of merchants and planters interested in Rhea. These plants could be grown as hedges throughout the whole tea and coffee districts of India and might afford annually two or three cuttings of fibre-yielding twigs practically at a nominal cost. Manufacturers who may think the grounds for the high expectations here held out sufficiently justified to warrant their embarking in experiments, would find little difficulty in having a ton or two of the twigs collected, dried, and baled to Europe, or even decorticated locally. The species most highly commended (V. integrifolia) is a plentiful jungle bush in Burma, Assam, Bengal, and the North-West Provinces. On the lower Himálaya and the mountain tracts of these provinces one or other of the species abounds. That they yield admirable fibres, we have the testimony of all modern observers (Brandis, Kurz, Gamble, etc.), but that they deserve to rank with the best Rhea, as Royle's *Ban-rhea* would appear to do, is a point which future re-investigation can alone establish. But this at least seems undeniable—they deserve to be rescued from the generic oblivion of 'Rhea.' Before leaving the subject of the Villebrunea fibres it may be as well to caution intending planters that there are several plants remarkably like the Villebruneas all of which yield good fibres though apparently inferior to those obtained from the *Ban-rhea*. In connection with the preparations for the Colonial and Indian Exhibition the Manager of the Glen Rock Fibre Company was good enough to forward to the writer botanical specimens and small samples of the fibres obtained from a few of the allied Rhea plants with which that Company was then experimenting. The following determination of these plants may be of interest, the more so since one or two of these belong to the class that might be mistaken as species of Villebrunea :—

1st—Two samples marked Urtica tenacissima.

"These appear to be large forms of Bœhmeria nivea, the China-grass, and not of Bœhmeria tenacissima, the Rhea as accepted by the writer.

2nd—A sample marked *Oreocknide*.

"This is Villebrunea integrifolia, *var.* sylvatica, a plant regarding the fibre of which we have no information. Whether superior or inferior to V. integrifolia proper, is a point which can alone be solved by comparative tests. The present plant may be recognised by its glabrous leaves (except on the veins below), and sessile, small heads of flowers.

3rd.—A sample marked *Yaumúri nar*.

"This is Trema amboinensis, *Bl.*, a fibre-yielding plant very inferior to the Villebruneas.

4th.—Debregeasia velutina (Conocephalus niveaus, *Wight*)—the *Capsi* of Bombay. The fibre sent along with this seems of good quality. The plant is common in the Concan and Ghát jungles and on the Nilgiri hills, etc.

VINCA pusilla.

FIBRE.

"The last three plants have long leaves with crowded heads of small flowers and to a non-botanist *might* be mistaken for Villebrunea integrifolia. (*J. Murray*)

5th —**Girardinia heterophylla**, *var.* **zeylanica.**
The Nilgiri Nettle

"The specimen No. 1 is m...
taken for a V...
niveus, ... other plant to be mis-
best kno ... It is the Conocephalus

"The reader is referred to the ... ...alled rhea fibres is the one
geasia (under which also will be found Conocephalus), but as a popular
eye-mark it may be said that the Debregeasias are erect bushes having
small densely tomentose leaves, and sessile flower-clusters, the females
through the succulent growth of the perianth forming edible minute fruits
that become agglomerated together like lac around the twigs. The species
of Villebrunea and also of Conocephalus have the flowers borne on short
flowerstalks, and in the former the leaves are large but not silvery tomentose
below, and the margins almost entire, instead of being minutely and
sharply serate as in the Debregeasias, while the species of Conocephalus
are climbing shrubs with the leaves quite entire.

"Although the fibre obtained from the Debregeasias is most probably
very inferior to that of the Villebruneas, the plants are more hardy and
might with advantage be propagated all over India. They occur on the
margins of neglected fields, especially along the foot of the Himálaya,
and in South India; they ascend the hills to 7,000 feet. Dense under-
growths of these plants exist in the shady glades of the Himálaya, caus-
ing the hill-sides, with the ripplings of a gentle breeze, to appear as if
sprinkled with snow. A perfectly inexhaustible supply, therefore, of
Debregeasia fibre might be obtained.

"The record of a Conocephalus fibre, resting on a mistaken identifica-
tion, all reference to that genus was omitted from the *Dictionary of the
Economic Products of India* No authentic information exists as to any
of the species of Conocephalus being used by the people of India, though
they doubtless possess strong fibres like most other Urticaceous plants
The fibre of Debregeasia velutina (the Conocephalus niveus of certain
writers) is, however, of such high merit as to deserve special notice, and it
should be critically examined along ... ...ebrunea fibre, since of
the Debregesias that ... ...n the plains of India
than ... ...o-called Conocephalus
i... would pay handsomely to cultivate the plant, and as with Villebrunea
... at £70 a ton. If even half that sum could be realised ... Glen Rock Company and is said
it is probable that the separation of the fibre would be easier than that of
Rhea or China-grass. Both these plants possess a property of great
merit; they are small trees that stand coppicing freely, and might, as
already urged, be grown by the coffee and tea planters as hedges and
also in the deeper nullahs where tea and coffee cannot conveniently be
grown. Once planted they would require little or no care and would
yield a valuable crop of fibre and willow-like twigs for basket-making
which might be profitably used on the estate, while the surplus would find
a ready sale."

VINCA, *Linn.*; *Gen. Pl*, *II.*, 703.

Vinca pusilla, *Murr.*; *Fl. Br. Ind.*, *III.*, 640; APOCYNACEÆ. 134

Syn.—V. PARVIFLORA, *Retz.*; CATHARANTHUS ROSEUS, *G. Don.*

Vern.—*Kapa-vila*, MALAY.; *Sangkhi*, *sangkhaphuli*, SANS.

The Sweet Violet.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 242; Dalz. & Gibs., Bomb. Fl., 144; Rev. A. Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 8731; Rheede, Hort. Mal., IX., t. 33; Ainslie, Mat. Ind., II., 358; O'Shaughnessy, Beng. Dispens., 448; Dymock, Mat. Med. W. Ind., 2nd Ed., 509; Atkinson, Him. Dist., 313; Gazetteers:—Mysore & Coorg, I., 62; Bombay, XV., 438; N.-W. P., I., 82; IV., lxxiv.*

Habitat.—An erect, pale-green annual, found in the Western Himálaya at Garhwál, altitude 2,000 feet, in the Gangetic plain, and commonly in the Deccan.

MEDICINE. Plant. 137 Medicine.—Ainslie writes, "Dr. F. Hamilton informs us (*MSS.*) that the *sangkhi* is a medicinal plant in Upper India, and that a decoction of the dried PLANT, boiled in oil, is rubbed on the loins in cases of lumbago." Royle, O'Shaughnessy, and other writers have repeated this statement without adding anything to our knowledge of the value of the remedy.

138 Vinca rosea, *Linn.; Fl. Br. Ind., III., 640.*

THE RED PERIWINKLE.

Vern.—*Ainskati*, URIYA; *Rattanjot*, PB.; *Sadaphúl*, MAR.; *Billa ganneru*, TEL.; *Them-ban-ma-hnyo-ban*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 242; Kurz, For. Fl. Burm., II., 178; Stewart, Pb. Pl., 143; Mason, Burma & Its People, 432, 799; Elliot, Fl. Andhr., 27; Gazetteers:—Mysore & Coorg, I., 62; N.-W. P., IV., lxxiv.; Orissa, II., 178.*

Habitat.—A West Indian plant, much cultivated in gardens and about pagodas, etc., in India; occasionally domesticated in waste places near villages.

MEDICINE. Juice. 139 Leaves. 140 Medicine.—This species is mentioned as *rattanjot* under the name of V. minor by Honigberger, who attributes the properties of that drug to it (see Onosma echioides, *Linn.*; also Trichodesma). Surgeon-Major P. N. Mukerji, in a note to the Editor, states the JUICE of the LEAVES is employed in Orissa as an application to wasp stings.

VIOLA, *Linn.; Gen. Pl., I., 117, 970.*

141 Viola cinerea, *Boiss.; Fl. Br. Ind., I., 185;* VIOLACEÆ.

Vern.—*Banafsha*, SIND & PB.

Reference.—*Murray, Pl. & Drugs, Sind, 45.*

Habitat.—Common in the dry hilly region of the Panjáb and Sind.

MEDICINE. Plant. 142 Medicine.—Murray states that this PLANT is used medicinally in Sind, in the same way as V. odorata.

143 V. odorata, *Linn.; Fl. Br. Ind., I., 184.*

THE SWEET VIOLET.

Vern.—*Banafshah*, HIND.; *Banosa*, BENG.; *Banafshah*, DEC.; *Banafshah*, BOMB.; *Baga banosa*, MAR.; *Banaphsa*, GUZ.; *Vayilettu*, TAM.; *Banafshaj, banafsaj, behussej*, ARAB.; *Banafshah*, PERS.

References.—*O'Shaughnessy, Beng. Dispens., 208; Irvine, Mat. Med., Patna, 12; Moodeen Sheriff, Supp. Pharm. Ind., 255; Mat. Med. S. Ind. (in MSS.), 30; Murray, Pl. & Drugs, Sind, 45; Bentl. & Trim., Med. Pl., t. 25; Dymock, Mat. Med. W. Ind., 2nd Ed., 65; Dymock, Warden & Hooper, Pharmacog. Ind., I., 140; Official Corresp. on Proposed New Pharm. Ind., 224; Year-Book Pharm., I., 8, 74, 622; Birdwood, Bomb. Pr., 8; Smith, Econ. Dict., 431; Gazetteer, Mysore & Coorg, I., 57; II., 13; Agri.-Horti. Soc. Ind., Trans., II., 121; VII., 71.*

Habitat.—Met with in Kashmír, at altitudes from 5,000 to 6,000 feet.

MEDICINE. 144 Medicine.—Dymock writes, "The Greeks made use of this herb as a medicine, and from them and their works the Muhammadans probably became acquainted with its properties; it does not appear to have been used by the early Hindu physicians. A long account of its properties will be found in most Arabic and Persian works on Materia Medica; it is gene-

rally considered cold and moist, and is especially valued as a diuretic and expectorant, and as a purgative in bilious affections; it is sold but is prescribed along with other d... action, such as tam...

VISCUM album.

MEDICINE

... but without success ... with the dry plant as a substitute ... ought and diaphoretic, and very useful in relieving febrile symptoms and excite- Moodeen Sheriff considers it antipyretic ment in all forms of fever, particularly in combination with other drugs of the same class (*Mat. Med. Madras*).

CHEMISTRY. 145

Chemical Composition.—"The flowers are said to contain, besides colouring matter, slight traces of a volatile oil, three acids—one red, another colourless, and salicylic acid; an emetic principle called *violin*, probably identical with *emetine*, *viola-quercitrin* in close relation to, but not identical with, *quercitrin* or *rutin* (*mandelin*); and sugar, etc. The colouring matter of the flowers is easily turned red by acids, and green by alkalis, and hence the syrup of violets was formerly used as a reagent. The colourless acid called violenic acid by Peretti is said to crystallise in silky needles, to be soluble in water, alcohol, and ether, and to form yellow salts which stain the skin. According to Boullay all parts of the plant contain violin" (*Pharmacog. Ind*).

Flowers. 146

Special Opinions.—§ "The flowers are collected in large quantities at and round Murree, Panjáb, and exported to the plains, to be employed as an emetic" (*Surgeon-Major J. E. T. Aitchison, Simla*). "An infusion useful as a mild purgative in cases of fevers and hepatic disturbances" (*Civil Surgeon F. F. Perry, Jallunder City, Panjáb*) "A *sherbet* made of *bunafshah* has been found to be useful in fevers; cooling, diaphoretic" (*Assistant Surgeon S. C. Bhattacharji, Chanda*). "An infusion of 2 drams of the dried plant to 1 pint of water forms an excellent and certain diaphoretic" (*Civil Surgeon C. M. Russell, Sarun*). "Diuretic, not purgative" (*Assistant Surgeon Nehal Singh, Saharunpore*). "The flowers warmed in boiling water are used as poultice in inflammatory affections of the throat and other parts of the body. It is extensively used by Natives as a laxative, diaphoretic in fevers; in fact this drug forms one of the ingredients of almost every prescription given by Native *hakims*" (*Assistant Surgeon Bhagwan Das, Rawalpindi*).

Viola serpens, *Wall.; Fl. Br. Ind., I, 184.* 147

Syn.—V. Wightiana var. pubescens, *Thw*, V. pilosa, *Blume*.

Vern.—*Thungtu, banafsha*, Hind., Kumaon; *Banafsha*, Pb.

References.—*Thwaites, En. Ceyl. Pl., 20, Stewart, Pb Pl., 19, O'Shaughnessy, Beng. Dispens., 209; Baden Powell, Pb. Pr, 331, 425; Atkinson, Him. Dist, 305, 753; Ind. Forester, II, 24; Agri.-Horti Soc. Ind, Trans, VII, 71.*

Habitat.—Met with in the moist weeds throughout the Temperate Himálaya, Khásia Hills, Pulney and Nilgiri Mountains, and Ceylon; altitude 5,000 to 7,000 feet.

MEDICINE. 148

Medicine.—This species also yields part of the *banafsha* of the bazárs, and is considered to have medicinal properties similar to those of V. odorata. Baden Powell states that a medicinal oil is prepared in the Panjáb from it, called *raughan-i-banafsha*.

VISCUM, *Linn.; Gen. Pl., III., 213.*

...scum album, *Linn.; Fl. Br. Ind, V., 223;* Loranthaceæ. 149

The Mistletoe.

Syn.—V. STELLATUM, *Don.*

Vern.—*Ban, banda,* HIND.; *Hurchu,* NEPAL; *Bhangra, banda, bamba, kahbang, ahalú, wahal, rini, reori, reng, ringi, jerra,* PB.; *Túrapanli,* AFGH.; *Dibki,* ARAB.

References.—*Kurz, For. Fl. Burm., II., 323; Brandis, For. Fl., 392; Gamble, Man. Timb., 319; Stewart, Pb. Pl., 112; Dymock, Mat. Med. W. Ind., 2nd Ed., 754; Agri.-Horti. Soc. Ind., Journ. (Old Series), IV., Sel., 262; XIV., 13.*

Habitat.—This parasite occurs commonly in the Temperate Himálaya, from Kashmír to Nepál, between 3,000 and 7,000 feet, where it chiefly grows on trees of the Natural Order ROSACEÆ, and in the walnut, elm, willow, alder, maple, poplar, olive, and mulberry.

MEDICINE. Plant. 150 Medicine.—The PLANT is used as a medicine in Lahoul. Honigberger states that, in the Panjáb, it is given in enlargement of the spleen, in cases of wound, tumours, diseases of the ear, etc. The dried berries imported into Bombay under the name of *kishmish-i-káwuliyán* (*vulg. kishmish-kawli*) are probably obtained from this species (*Dymock*).

DOMESTIC. 151 Domestic.—In Europe it is employed in making bird-lime.

152 **Viscum articulatum,** *Burm.; Fl. Br. Ind., V., 226.*

Syn.—V. ATTENUATUM, *DC.*; V. MONILIFORME, *Blume*; V. FRAGILE, *Wall.*; V. COMPRESSUM, *Poir.*; V. APHYLLUM, *Griff.*

Var. dichotoma, *Kurz*=V. DICHOTOMUM, *Don*; V. ELONGATUM, *Wall.*; V. NEPALENSE, *Spreng.*

Vern.—*Pan, púdú,* HIND.; *Katkom janga,* SANTAL; *Hurchu,* NEPAL; *Patha,* BANDA; *Banda,* C. P.

References.—*Kurz, For. Fl. Burm., II., 325; Brandis, For. Fl., 394; Rev. A. Campbell, Rep. Ec. Pl., Chutia Nagpur, No. 8431; Atkinson, Him. Dist., 316; Gazetteers:—Bombay, XV., 441; N.-W. P., I., 81.*

Habitat.—A native of the Sub-tropical Himálaya from Chamba eastward to Sikkim, ascending to 3,000 feet; also met with in Assam, Mishmi and the Khásia Mountains, where it ascends to 6,000 feet, and southwards to Travancore, Malacca, and Ceylon. *Var.* dichotoma occurs in the Himálaya, the Khásia Mountains, the higher hills of Pegu, and the Deccan Peninsula.

MEDICINE. Plant. 153 Medicine.—In Chutia Nagpur, a preparation from the PLANT is given in fever attended with aching limbs. The many joints in the plant have probably influenced the Santal *ojhas* in their application of it,—it is probably one of the many cases of the use of a remedy from a belief in the theory of signatures (*Campbell*).

154 **V. monoicum,** *Roxb.: Fl. Br. Ind., V., 224.*

Syn.—V. FALCATUM, *Wall.*; V. BENGHALENSIS & ? V. CONFERTUM, *Roxb.*

Vern.—*Kuchle-ka-malang,* HIND.; *Pet chamra banda,* SANTAL; *Kuchlé-ki-sonkan,* DEC.; *Pulluri,* TAM.; *Pullurivi,* TEL.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 715; Kurz, For. Fl. Burm., II., 324; Gamble, Man. Timb., 319; Rev. A. Campbell, Rep. Ec. Pl., Chutia Nagpur, No. 8170; O'Shaughnessy, Beng. Dispens., 376; Moodeen Sheriff, Supp. Pharm. Ind., 255; Gazetteer, N.-W. P., IV., lxxvii.; Agri.-Horti. Soc. Ind., Trans., VII., 64; Journ. (Old Series), VI., 38.*

Habitat.—A large shrub met with in the Sikkim Himálaya, between 2,000 and 4,000 feet, the Khásia Mountains up to 3,000 feet, the Ganges Delta, Oudh, Martaban and Tenasserim, and the Nilgiri Hills.

MEDICINE. Leaves. 155 Medicine.—The LEAVES of a Viscum, doubtfully referred to this species, growing on Nux Vomica trees in the neighbourhood of Cuttack, have been found to possess poisonous properties, similar to those of the tree on which it grows. The subject was investigated by O'Shaughnessy, who detected strychnine and brucine in the powdered leaves. The powder of

the dry leaf was used as a substitute for these drugs in the Hospital of the Medical College, Calcutta, with complete success, in doses of one to three grains thrice daily (*Beng. Dispens.*). (*J. Murray*)

Viscum orientale, *Willd.; Fl. Br. Ind. V, 224.* 156

Syn.—V. VERTICILLATUM, *Roxb.*; V. HEYNEANUM, *DC.*, V. INDICUM, *Rottl.*

Vern.—*Banda*, HIND., SANTAL, KOL., *Sundara badinika*, TEL.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 715, Kurz, For. Fl. Burm., II., 324; Brandis, For Fl., 393, Gamble, Man Timb., 319; Rev. A Campbell, Rep. Ec. Pl, Chutia Nagpur, No. 9224, Elliot, Fl. Andhr., 170.*

Habitat.—A rather large much-branched shrub, with purple fruit, found from Behar, Bengal, and Singapore, southwards to Singapore, Travancore, and the central provinces of Ceylon.

Medicine.—In Chutia Nagpore, "this PLANT is largely used medicinally, and is believed to derive some particular property from the tree on which it is found. It is employed in as many different diseases as the trees on which it is found" (*Campbell*). MEDICINE. Plant. 157

VITEX, *Linn.; Gen. Pl., II., 1154.*

Vitex altissima, *Linn.; Fl. Br. Ind., IV., 584; Wight, Ic., t. 1466;* [VERBENACEÆ. 158

Var. zeylanica=V. ZEYLANICA, *Turcz.*; V. ALTISSIMA (FORME SUBGLABRA), *Thwaites.*

Vern.—*Ahay*, ASSAM; *Simyanga, gua*, KOL.; *Banalgay*, MAR. & BOMB.; *Maila*, TAM.; *Namili adogú*, TEL.; *Myrole, balgay, nauladi, sampagapala*, KAN.; *millilla, milla*, SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 482; Beddome, Fl Sylv., t 252; Brandis, For Fl., 370; Gamble, Man. Timb., 297, Dals. & Gibs., Bomb. Fl., 201 Thwaites, En. Ceyl Pl, 244, Drury, U Pl, 442; Birdwood, Bomb. Pr., 335, Lisboa, U. Pl. Bomb, 108, For Admn Rep., Ch. Nagpur, 1885, 33, Gazetteer, Bombay, XV., 40, 87; Gribble, Man. Cuddapah, 262, Ind. Forester, III, 23, 178, 204; VI., 338, VIII., 29; X, 31, 33; XII., 551.*

Habitat.—A large tree of Bengal, South India, and Ceylon; especially common in Western India, up to 4,000 feet.

Structure of the Wood.—Grey with a tinge of olive brown, hard, close-grained; weight 50 to 53lb per cubic foot (*Gamble*). Skinner gives 63lb per cubic foot for Kanara specimens. Beddome describes the timber as one of the most valuable in South India; it does not split nor warp, polishes well, and is much used for building purposes, for cabinet work, and for making carts. It appears to be well worthy of attention. TIMBER. 159

V. glabrata, *Br.; Fl. Br. Ind., IV., 588.*

Syn.—V. CUNNINGHAMI, *Schauer*; V. LEUCOXYLON, *Schauer* (not of *Linn* but described as V. LEUCOXYLON, *Linn. f.*, by *Kurz, Gamble*, and partly by *Brandis*); V. BOMBACIFOLIA, *Wall.*; V. PALLIDA, *Wall.*

Vern.—*Goda, horina, ashwal*, BENG.; *Bhodiya*, ASSAM; *Tokra*, MAGH; *Sheras, longarbis thiras*, BOMB.; *Longarbi thiras, sherasa, songarbi*, MAR.; *Luki, neva lédi*, TEL.; *Sengeni, karril, senkane*, KAN.; *Htoukshar*, BURM.

References.—*Brandis, For. Fl., 370; Kurz, For. Fl. Burm., II, 273; Dals. & Gibs., Bomb. Fl, 201; Elliot, Fl. Andhr, 134; Rheede, Hort. Mal., IV., t. 36; Lisboa, U. Pl. Bomb., 108; Gazetteer, Bombay, XV., 78, Ind. Forester, X., 222.*

Habitat.—A small (very large, deciduous, *Gamble*) tree, common from uth Assam and Cachar to Malacca. Considerable confusion exists in dian literature between this species and V. leucoxylon, *Linn. f.*, a native South India and Ceylon, which Kurz, and following him, Gamble,

MEDICINE. Bark. 160 Root. 161 appear to have united. It is probable, however, that most of the information here given refers to **V. glabrata.**

Medicine.—The BARK and ROOT are used as astringents in the Andaman islands (*Major Ford*).

FOOD. Fruit. 162 **Food.**—The tree flowers in April, and produces a small, black FRUIT containing very soft pulp, which is eaten by Burmese in the Andaman islands.

TIMBER. 163 **Structure of the Wood.**—Grey with a satiny lustre, hard, close-grained, durable; weight about 42lb per cubic foot. It is used for cart-wheels, and deserves attention for furniture and other purposes (*Gamble*).

164 **Vitex Negundo,** *Linn.; Fl. Br. Ind., IV., 583; Wight, Ic., t. 519.*

Syn.—V. BICOLOR, *Willd.*; V. ARBOREA, *Desf.*; V. PANICULATA, *Lamk.* **Var. incisa**=V. INCISA, *Lamk.*

Vern.—*Sanbhálú, nirgandi, sindhuca, nisindá, páni-ki-sambhálú, shiwari, shawáli, nengar, mewri, sambhálu, sambhal, sinduari,* HIND.; *Nishindá, sámálú, nisinda, nirgúndi,* BENG.; *Ekúri, sindwor, hobaro, sinduari,* KOL.; *Sinduari,* SANTAL; *Beygúna, beguniyá,* URIYA; *Nirgudi,* KURKU; *Semálu,* BERAR; *Nirgiri,* GOND; *Sindwar,* KHARWAR; *Shiwáli, simáli,* fruit=*filfil=bári,* KUMAON; *Marwan, moráun, maura, mora, wana, banna, torban, biuna, binna, torbanna, morann, sanake, swanján, shwári, bankahú, marwa, mawá,* root & leaves=*amalu,* fruit=*filfil=bari,* PB.; *Marwandai, mehrwán, warmandr,* PUSHTU; *Shanbáli, shambáli, shamálú,* DECCAN; *Nirgundi, kátri, lingúr, nargunda, nirgur, shiwari, nisinda,* BOMB.; *Nirgunda, nirgúr, nirguda, lingúr,* MAR.; *Nirgari, nagoda,* GUZ.; *Vellai-noch-chi, noch-chi, nir-nochchi,* TAM.; *Tella-vávili, vávili, veyala, nalla vávili, vavali-padi,* TEL.; *Lakki-gidá, lakki, lakkie,* KAN.; *Vella-noch-chi, vel-noch chi, noch-chi,* MALAY.; *Kiyon-bhan-bin,* or *kiyuban-bin,* BURM.; *Nikka, sudu-nikka,* SING.; *Shweta-surasa, vrikshaha, nirgundi, sindhuvára,* SANS.; *Aslag, fanjangasht, sukhamsatilourag, sukhamsaze-asabea,* ARAB.; *Sishan, panj-angusht, banj-angasht,* PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 481; Brandis, For. Fl., 369; Kurz, For. Fl. Burm., II., 269; Beddome, For. Man., 171; Gamble, Man. Timb., 297; Dalz. & Gibs., Bomb. Fl., 201; Stewart, Pb. Pl., 166; Rev. A. Campbell, Rept. Econ. Pl., Chutia Nagpur, No. 8198; Sir W. Elliot, Fl. Andhr., 128; Sir W. Jones, Treat. Pl. Ind., V., 136; Rheede, Hort. Mal., II., t. 12; Rumphius, Amb., IV., t. 19; Lace, Quetta Pl. ; Pharm. Ind. 163; Ainslie, Mat. Ind., II., 252; O'Shaughnessy, Beng. Dispens., 485; Irvine, Mat. Med. Patna, 77; Taylor, Topog. Dacca, 55; Moodeen Sheriff, Supp. Pharm. Ind., 256; U. C. Dutt, Mat. Med. Hind., 217, 311, 318; Murray, Pl. & Drugs, Sind, 175; Dymock, Mat. Med. W. Ind., 2nd Ed., 600; Cat. Baroda Durbar, Col. & Ind. Exhib., Nos. 183, 184; Official Corresp. on Proposed New Pharm. Ind., 238; Drury, U. Pl. Ind., 442; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 315, 753; Useful Pl. Bomb. (XXV., Bomb. Gaz.), 100; Moore, Man. Trichinopoly, 80; Gribble, Man. Cuddapah, 76; For. Admin. Rep. Chutia Nagpur, 1885, 33; Settlement Report:—Panjab, Peshawar, 13; Kohat, 30; Gazetteers:—Bombay, VI., 15; VII., 42; XV., 78; XVII., 25; Panjab, Dera Ismail Khan, 19; Karnal, 16; Bannu, 23; Hoshiarpur, 12; Peshawar, 27; Lahore, 95; N.-W. P., I., 83; IV., lxxvi.; Orissa, II., 181; Rajputana, 26; Agri.-Horti. Soc.:—Ind., Journals (Old Series), VI., 49, 225; X., 21; XIII., 319.*

Habitat.—A deciduous shrub, common throughout India and Ceylon, and ascending to 5,000 feet in the North-West Himálaya.

DYE. Ashes. 165 **Dye.**—The ASHES of this plant are largely used as an alkali in dyeing.

MEDICINE. Root. 166 Leaves. 167 Juice. 168 **Medicine.**—U. C. Dutt informs us that, according to Sanskrit writers, there are two forms of *nirgundi*,—that with pale blue flowers, *sindhuvára* (V. trifolia), and that with blue flowers, *nirgundi*. The properties of both are said to be identical, but the latter is generally used in medicine. The ROOT of **Vitex Negundo** is considered tonic, febrifuge, and expectorant, and the LEAVES aromatic, tonic, and vermifuge. The JUICE of the leaves is

(J. Murray)

VITEX Negundo.

MEDICINE.

largely employed for soaking various metallic powders, before making the latter into pills. A decoction of the leaves is given, with the addition of long pepper, in catarrhal fever with heaviness of the head and dullness of hearing (*Bhavaprakasha*). A pillow stuffed with the leaves is placed under the head for relief of headache The juice of the leaves is said to remove fœtid discharges and worms from ulcers. An OIL prepared with the juice of the leaves is applied to sinuses and scrofulous sores (*Chakradatta*). Dymock states that Muhammadans consider *athlak* or *panjangusht* (which as sold in Bombay appears to be the fruit, not of **V. Negundo** or of **V. trifolia**, but of **V. Agnus-castus** of Europeans) as astringent, resolvent, and attenuant

Oil. 169

The Indian medicinal species of Vitex early attracted the notice of Europeans. "**V. trifolia** is highly extolled by **Bontius**, under its Malayan name; he speaks of it as anodyne, diuretic, and emmenagogue, and testifies to the value of fomentations and baths prepared with 'this noble herb,' as he terms it, in the treatment of *Beri-beri*, and in the obscene affection of 'Burning of the feet' in Natives. Of **V. Negundo**, **Fleming** remarks that its leaves have a better claim to the title of discutient than any other vegetable remedy with which he is acquainted, and he adds that their efficacy in dispelling inflammatory swellings of the joints from acute rheumatism, and of the testes from suppressed gonorrhœa, has often excited his surprise The mode of application followed by Natives, and adopted, according to **Dr. Fleming**, by some European practitioners in India, is simple—the fresh leaves, put into an earthen pot, are heated over a fire till they are as hot as can be borne without pain; they are then applied to the affected part, and kept *in situ* by a bandage, the application is repeated three or four times daily until the swelling subsides" (*Pharm Ind*). **Roxburgh** describes both species as medicinal, and mentions that the leaves of **V. Negundo** are employed to form a warm-bath for women after delivery. **Rumphius** & **Rheede** both particularly notice **V. trifolia**, the first recommending it externally in swellings and diseases of the skin, while the latter asserts that the powdered leaves taken with water cure intermittent fevers. **Ainslie** writes that the fruit of the same species is supposed by the *Vytians* to be nervine, cephalic, and emmenagogue, and is prescribed in powder, electuary, and decoction The medicinal qualities of **V. Negundo** he considered to be similar to but weaker than those of **V** trifolia. He adds, however, that the ROOT of the former is a pleasant bitter and useful in fever, and that the Muhammadans smoke the dried leaves in cases of headache and catarrh *Irvine* states that a decoction of the leaves is used in Patna as an internal remedy for fever. **Taylor** writes that in Dacca the leaves are given with garlic, rice, *gúr*, etc., as a remedy for rheumatism.

Root. 170

Both species are given a place in the Pharmacopœia of India, where, in ddition to part of the above information, it is stated that **Dr. W. Nigledew** as described a very interesting method of treating febrile, catarrhal, and eumatic affections in Mysore, by means of a rude vapour bath prepared th the plant. The dried FRUIT is considered vermifuge.

Fruit. 171

CHEMICAL COMPOSITION.—"Nothing is known of the chemistry of se plants, but the seed of **V. Agnus-castus** is said to contain a peculiar er principle called *castine*, a volatile acrid substance, a large quantity ree acid and fat oil. In Greece the fresh and rather unripe berries are to be added to the merit of the grape to render the wine more intoxig, and prevent it from turning sour" (*Dymock*).

Chemistry. 172

PECIAL OPINIONS.—§ "The leaves, baked and applied to the head warm or used as a pillow, relieve headache" (*Surgeon-Major Lionel* , *Coconada*). "Given also in frontal head aches" (*Surgeon W. F.*

MEDICINE. *Thomas, 33rd M. N. I., Mangalore*). "The leaves (fresh) are credited with the power of destroying the smell of high or tainted meat or fish when boiled with it. The leaves, bruised and formed into cakes, may be applied to the temples to relieve headache" (*Civil Surgeon Banku Behary Gupta, Poori*). "I have often used a bath medicated with the leaves in cases of rheumatism and swelling of joints with excellent results" (*Honorary Surgeon E. A. Morris, Tranquibar*). "Leaves and root diuretic, diaphoretic and tonic. Tincture,—root bark 2 oz., Proof spirit 10 oz. Dose 1 to 2 drams three times a day is found useful in irritable bladder and rheumatism" (*Apothecary Thomas Ward, Madanapalla, Allahabad*).

TIMBER. 173 **Structure of the Wood.**—Wood greyish-white, hard; weight 42lb per cubic foot. It is used for building purposes, and as a fuel, and the branches for wattle-work.

174 **Vitex peduncularis**, *Wall., var.* **Roxburghiana**; *Fl. Br. Ind.*, [*IV.*, 587.

Syn.—V. ALATA, *Roxb.*

Vern.—*Boruna, goda*, BENG.; *Osai*, ASS.; *Bhadu, marak'*, SANTAL; *Krawru*, MAGH; *Hila auwal*, CACHAR; *Shelangri*, GARO; *Navalādi*, KAN.; *Kyetyo*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 482; Kurz, For. Fl. Burm., II., 272; Gamble, Man. Timb., 298; Dalz. & Gibs., Bomb. Fl., 201; Rev. A. Campbell, Rept. Ec. Pl., Chutia Nagpur, No. 9281; Lisboa, U. Pl. Bomb., 201; Aplin, Rep. on the Shan States; Gazetteer, Mysore & Coorg, I., 48, 64.*

Habitat.—A tree met with in Behar, at Parisnath, in Eastern Bengal, the Khásia Tarai, and Pegu. According to Dalzell & Gibson it is also found in the Southern Mahratta country (Warri jungles) and the Konkan.

MEDICINE. Bark. 175 **Medicine.**—In Chutia Nagpur the BARK is used for making an external application for pains in the chest (*Campbell*).

TIMBER. 176 **Structure of the Wood.**—Purplish or reddish-grey, heavy, hard, close-grained; weight 60lb per cubic foot. It is a good timber, used in Cachar for posts and beams, in the Garo hills for sugarcane crushers, and in Chutia Nagpur for yokes.

177 **V. pubescens**, *Vahl.; Fl. Br. Ind., IV., 585; Wight, Ic., t. 1465.*

Syn.—V. ARBOREA, *Roxb.*; PISTACIA VITEX, *Linn.*

Vern.—*Muria*, URIYA; *Nowli eragu, búsi, nevali adugu, nevaladugu mánu*, TEL.; *Myladi*, TAM.; *Kyet-yob, htouk-sha*, BURM.

References.—*Roxb., Fl. Br. Ind., Ed. C.B.C., 482; Kurz, For. Fl. Burm., II., 271; Beddome, For. Man., 171; Gamble, Man. Timb., 297; Elliot, Fl. Andhr., 32, 124; Mason, Burma & Its People, 526, 792; Drury, U. Pl. Ind., 443; Ind. Forester, III., 204.*

Habitat.—A large tree of Eastern Bengal, Burma, the Andaman Islands, and South India.

TIMBER. 178 **Structure of the Wood.**—Wood smooth, grey, with an olive-brown tinge, when old, chocolate coloured; very hard, close-grained; weight about 55 lb per cubic foot (*Gamble*). It is durable, and is used for various purposes in South India; the Burmans employ it to make wooden bells (*Mason*).

179 **V. sp.**

Vern.—Seeds=*Hab-ul-fakad*, ARAB.; *Tukm-i-panjangusht*, PERS.; *Shambaloo kabij*, HIND.; *Renu kabij*, BOMB.

The above are given by **Moodeen Sheriff** as names for **Vitex Negundo**, but according to **Dymock**, though the seeds of this species are considered by Muhammadan physicians to be identical with the Indian *saubhálú*, they are not really so, but belong to another species.

References.—*Dymock, Mat. Med. W. Ind., 2nd Ed., 600; Year-Book Pharm., 1880, 250.*

(G. Watt) VITIS adnata.

MEDICINE. Fruit. 180

Medicine.—A small, dull grey, ovoid FRUIT, the size of a duck shot, half enclosed in the calyx, to which a portion of the peduncle remains attached. It is imported from Persia, and is considered to act as a resolvent and deobstruent in enlargements of the spleen, probably the fruit of V. Agnus-castus.

181 **Vitex trifolia**, *Linn.*; *Fl. Br. Ind*, *IV.*, *583*.

Syn.—V. INCISA, *Wall.*; V. AGNUS-CASTUS, var., *Kurz.*

Vern.—*Páni-ki-sanbhálú, sufḗd-sanbhálú, var.*, HIND; *Páni-samálú*, BENG; *Páni-ki-shanbáli, ulji-shanbali*, DEC.; *Nir-noch-chi, shiru-noch-chi*, TAM.; *Niru-vavili, shiru-vavili, tella-vavili*, TEL; *Nir-noch-chi*, MALAY.; *Nira-lakki-gidd*, KAN; *Kiyoubhan-bin, yé-kiyuban-bin*, BURM.; *Vaturu-nikka*, SINGH; *Surasa-vrikshaha, jala-nirgundi*, SANS.; *Asla-que-abi*, ARAB.; *Panj-angushta-abi, banj-angashte-abi*, PERS.

According to many writers the vernacular synonyms of V. Negundo, and of this species are the same. Moodeen Sheriff however, from whom the above has been quoted, states that the adjectives "white" and "water," which enter into the formation of so many of the terms, are properly applied to this species only.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 481; Beddome, For. Man., 172; Brandis, For. Fl., 370; Mason, Burma & Its People, 413, 479, 792; Elliot, Fl. Andhr., 180, 190; Pharm. Ind., 163; O'Shaughnessy, Beng. Dispens., 484; Irvine, Mat. Med. Patna, 118; Fleming, Med. Pl. & Drugs (Asiatic Reser., XI.), 184; Dymock, Mat. Med. W. Ind., 2nd Ed., 600; Birdwood, Bomb. Pr., 66; Baden Powell, Pb. Pr., 364; Drury, U. Pl. Ind., 443; Cooke, Oils & Oil-seeds, 81; Aplin, Rep. on the Shan States; Settle. Rep., Chanda, App. VI.; Gazetteer, Mysore & Coorg, I., 64; Ind. Forester, XII., App. 19.*

Habitat.—A shrub or small tree, found scattered throughout India in the tropical and sub-tropical regions, from the foot of the Himálaya to Ceylon and Malacca; nowhere common.

Oil.—Drury says that a clear, sweet OIL of a greenish colour is extracted from the ROOT. It is supposed that the SEED also yields a fatty oil. OIL. Root. 182 Seed. 183

Medicine.—See V. Negundo.

VITIS, *Linn.*; *Gen. Pl.*, *I.*, *387, 999*.

(G. Watt.)

Vitis acida, *Wall.*; see V. setosa, *Wall.*: p. 217; AMPELIDEÆ.

184 **V. adnata**, *Wall.*; *Fl. Br. Ind.*, *I.*, *649*; *Wight, Ic.*, *t. 144*.

Syn.—CISSUS ADNATA, *Roxb.*; C. CORDATA & KLEINII, *Wall.*; C. LATIFOLIA, *Vahl.*

Vern.—*Bod-lar-nari*, SANTAL; *Pani-lara*, PAHARIA; *Kungchen-rik*, LEPCHA; *Kole-zán*, BOMB.; *Gudama tige, kokkitayárálu*, TEL.

References.—*DC. Prodr., I., 627; Roxb., Fl. Ind., Ed. C.B.C., 136; Brandis, For. Fl., 100; Gamble, List of Trees, Shrubs, etc. Darjeeling, 20; Thwaites, En. Ceylon Pl., 62; Graham, Cat. Bomb. Pl., 32; Dalz. & Gibs., Bomb. Fl., 39; Rev. A. Campbell, Econ. Prod. Chutia Nagpur, No. 8467; Sir W. Elliot, Fl. Andhr., 63, 92; Dymock, Mat. Med. W. Ind., 2nd Ed., 183; Gazetteers:—Bombay, XV., 430; N.-W. P., IV., lxx; Him. Dists., X., 307; Agri-Horti. Soc. Ind.:—Trans., VII., 53; Journ., VI., 36.*

Habitat.—A slender, far-climbing plant, met with in the hotter parts of India, from the Western Himálaya to Assam, Sylhet, Bengal, Tenasserim, the Western Peninsula, etc. Distributed to Ceylon, Java, Borneo, the Philippine Islands, etc.

Fibre.—The Revd. A. Campbell tells us that the Santals prepare a good cordage FIBRE from the STEMS. FIBRE. Stems. 185

Medicine.—Dymock says that in Western India "the dried TUBERS are used by the country-people as an alterative in the form of a decoction; they consider that it purifies the blood, acts as a diuretic, and MEDICINE. Tubers. 186

VITIS carnosa.

The Horse-Vine.

MEDICINE. renders the secretions healthy." Mr. Campbell remarks that in the Santal

Root. country the ROOT powdered and heated is applied to cuts and fractures.

187 Food.—Gamble says the LEAVES are eaten by the Lepchas of Sikkim.

FOOD. Leaves. 188 **Vitis araneosus**, *Dalz. & Gibs.; Fl. Br. Ind., I., 657.*

Vern.—*Bendri, bender-wel, ghorwel* (or *ghorvel*=horse-vine), BOMB.

189 References.—*Dalz. & Gibs., Bomb. Fl., 41; Dymock, Mat. Med. W. Ind., 2nd Ed. 186; Pharmacog. Ind., I., 365.*

Habitat.—A slender, far-climbing plant, found in the Western Peninsula, the highest Gháts of the Concan, the Pulney mountains, etc.

MEDICINE. Roots. 190 Medicine.—Dymock says this vine is often "given to horses, when it first springs up; it is said to be very beneficial once a year. The tuberous, starchy astringent ROOTS, sliced and dried, are sold by the Konkan herbalists under the name of "*Chamar-musli.*"

191 **V. auriculata**, *Roxb.; Fl. Br. Ind., I., 658.*

Syn.—CISSUS AURICULATA, *DC.*

Vern.—*Kúra palléru*, TEL.; *Wa-young-khyen, yinhnaung peinne*, BURM.

References.—*Kurz, For. Fl. Br. Burm., I., 274; Mason, Burma and Its People, 742; Sir W. Elliot, Fl. Andhr., 104; Dalz. & Gibs., Bomb. Fl. 40; Gazetteers:—Mysore and Coorg, I., 59; Bombay, XV., 430; Agri.-Horti. Soc. Ind., Trans., VII., 53.*

Habitat.—A large, woody climber, found in the Eastern Himálaya (3,000 to 5,000 feet), to Bengal (Chittagong) and Burma (tropical mixed forests of the Pegu Yomah).

TIMBER. 192 Structure of the Wood.—"Reddish, very coarsely fibrous" (*Kurz*).

193 **V. barbata**, *Wall.; Fl. Br. Ind., I., 651.*

Syn.—V. LATIFOLIA, *Hb. Ham.*; V. LANATA, *Hb. Roxb.*

Habitat.—An extensive climber, with very remarkable long spreading glandular hairs; found in Assam and the Khásia hills to Pegu and Tenasserim.

FOOD. 194 Food.—This is probably the edible species alluded to by Mr. Darrah under the name of V. carnosa (which see); but greater interest may, perhaps, be said to centre in this plant from its being identified as possibly the same as V. Martini, *Planch.*, which has been alluded to by many writers as of importance as a possible new source of grapes. The reader will find a full account of that plant in the *Kew Bulletin, 1888, pp. 134 and 135*; also in *Christy's New Commercial Plants and Drugs.*

195 **V. carnosa**, *Wall.; Fl. Br. Ind., I., 654; Wight, Ic., t. 171.*

Syn.—CISSUS CARNOSA, ACIDA, and AURICULATA, *Roxb.*; C. CRENATA, *Vahl.*, also *Wall.*; C. CINEREA, *Lamk.*

Vern.—*Amal-bel, gidar-drak, kassar*, HIND.; *Bundal, amal-lata, sone-kesur* (Patna), BENGAL; *Jarila-lara*, PAHARIA; *Takbli-rik*, LEPCHA; *Maimati*, or *marmarati*, ASSAM; *Kárik, ámal bel, gidardák, drúkri, vallúr*, PB.; *Odi, ambat-bel*, MAR.; *Khát, khatumdre, tamanya*, GUZ.; *Odi*, BOMB.; *Kuru dinne, kádépa tige, kanapatige, mandulamári tige, mékamettani chettu*, TEL.

References.—*DC., Prod., I., 630; Roxb., Fl. Ind., Ed. C.B.C., 137; Brandis, For. Fl., 101; Gamble, Cat. Trees, Shrubs, etc., Darjeeling, 20; Stewart, Pb. Pl., 35; Graham, Cat. Bomb. Pl., 33; Sir W. Elliot, Fl. Andhr., 76, 81, 104, 111, 114; Rheede, Hort. Mal., VII., t. 9 (Kádi or "Yoke plant"); Rumphius, Amb., V., 450 f. t. 166 f. 2; Ainslie, Mat. Ind., I., 304; O'Saughnessy, Beng. Dispens., 254; Irvine, Mat. Med. Patna, 126; Sakharam Arjun, Cat. Bom., Drugs, 215; Dymock, Mat. Med. W. Ind., 2nd Ed., 183; Dymock, Warden and Hooper, Pharmacog. Ind., Vol. I., 365; Darrah, Note on the Condition of the People of Assam, App., D; Gazetteers:—Bombay, III., 203; XV., 430; N. W. P., I., 79; IV., lxx; Rajputana, 25; Agri.-Horti. Soc. Ind.:—Trans., VII., 53; Jour. VI., 36; Indian Forester, IV., 227; XII., app., 2, 10.*

Habitat.—A climber, found throughout the hotter parts of India, and ascending into the tropical Himálaya. Distributed to Burma, Ceylon, and Malacca.

Dye.—Ainslie suggests that a dye might be prepared from the acid FRUITS of this plant. DYE Fruits. 196

Medicine.—The names given to it in many parts of India denote one of its most general uses, namely, the treatment of yoke-sores on the necks of bullocks (*Elliot*). For that purpose a poultice of the LEAVES is most frequently employed. According to Irvine (*Mat Med Patna*) the MEDICINE. Leaves. 197

e- Seeds. 198

k, Roots. 199

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writers incorrect. *Conf. with* V. setosa, p. 257.

Food.—Darrah (*Note on the people of Assam*) says that the YOUNG TOPS are boiled as a spinach and eaten either by itself or with other vegetables along with fish. The writer found a vine so eaten in Manipur, which he thinks may be the same species as that alluded to by Mr. Darrah, and if so, it is an undescribed species which is very different from V. carnosa. Stewart, while dealing with V. carnosa and V. capriolata, says that (it or) they are eaten by camels. FOOD Tops, Young. 200 *Conf. with p. 252.*

Vitis discolor, *Dalz ; Fl. Br. Ind , I., 647.* 201

DISCOLOR, *Blume ;*

ible, *Cat. Trees & V., 430.*

, found wild in the

ipur, Chittagong,

istributed to Java.

forms it is often

and breadth of leaf when grown in shade only, as, for example, in the wattle-orchid houses of Calcutta gardens.

V. himalayana, *Brandis ; Fl. Br. Ind. I., 655.* 202

Syn.—AMPELOPSIS NEILGHERRENSIS, *Wight, Ic , t. 965 ;* A. HIMALAYANA, *Royle, Ill 149 ;* CISSUS HIMALAYANA, *Walp.*

Vern.—*Phlankur,* SIMLA ; *Zemardachan, zemaro,* SUTLEJ ; *Chappar tang,* KUMAON ; *Bara churcheri,* PAHARIA ; *Hlotagbret,* LEPCHA.

References.—*Brandis, For. Fl., 100 ; Gamble, Man. Timb., 93 ; Kurz, For. Fl. Burm., I , 73; Gamble, Cat Trees Shrubs, Darjeeling, 20 ;* ... *377 ; Ind. For-*

rs with its foliage

... at altitudes of 5,000 to 9,000 feet. In autumn these turn to a brilliant rosey tint, a fact which has given the plant the name of the "Virginian creeper" by the European residents at hill stations. Its area of distribution may be said to be from Kashmir to Sikkim, the Khásia hills, and Burma. It also occurs, however, in the Western Peninsula (Pulney hills).

TIMBER. 203 Structure of the Wood.—Coarse and fibrous. The stems are more destructive to the trees on which it climbs than useful, though the young stems, like those of most other vines, are used for natural cords to tie bundles of grass.

DISEASES. 204 Diseases.—This is the only Indian vine, so far as the writer can discover, that has ever been described as bearing a Uredinous fungus. The late Surgeon-Major Barclay (Paper on Uredineæ occurring in the neighbourhood of Simla, *Journ. Asiatic Soc. Bengal, LIX, Pt. II., 98*) describes this parasitic plant under the name of **Uredo Cronartiformis**, from its appearance suggesting a **Cronartium**. He adds, however, that though he looked carefully and continuously for the teleutosporic form, he had never found any trace of such.

205 **Vitis indica**, *Linn.; Fl. Br. Ind., I., 653.*

THE INDIAN WILD VINE.

Syn.—V. RUGOSA, *Wall.*

Vern.—*Amdhauku, amoluka*, BENG.; *Jangli-angur*, HIND. & DEC.; *Sambara* or *shembara-valli*, TEL.; *Chempara valli*, MALYAL.; *Randraksha, kole-ján* MAR.; *Yen-doung*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 221; Brandis, For. Fl., 100; Graham, Cat. Bomb. Pl., 33; Dalz. & Gibs., Bomb. Fl., 41; Ainslie, Mat. Med., 334; Moodeen Sheriff, Supp. Pharm. Ind., 257; Rheede, Hort. Mal., VII., 11, t. 6; Mason, Burma and Its People, 460, 742; Indian Forester, XII., App. 10; Gazetteers, N.-W. P., I., 79; IV., lxx.; Bomb., XV. (Kanara), 430; Stewart, Bot. Journey Hazara in Agri-Horti. Soc., XIV., 9; Pharmacog. Ind. (Dymock, Warden and Hooper), I., 362; Kew Bulletin, 1889, 23.*

Habitat.—A slender, wooly species, with large, perennial, tuberous roots, found in the Central tableland of India, in the Western Peninsula, the Concan, and in Bengal. In point of foliage and shape of the bunches of small fruits, this much resembles the cultivated vine.

MEDICINE. Juice. 206 Root. 207 Medicine.—Rheede was apparently the first European writer who assigned medicinal virtues to this plant. He says that the JUICE of the ROOT with the kernel of the cocoanut was, in his time, employed as a depurative and aperient. Dymock remarks that in the Concan, the country-folk also use it as an alterative in the form of a decoction, and they consider, he adds, that it purifies the blood, acts as a diuretic, and renders the secretions healthy.

FOOD. Fruits. 208 Conf. with p. 263. Tubers. 209 Food.—Few authors allude to the FRUITS being eaten, but this is probably an oversight, as they are regularly used, and the plant is often protected on hedges in a state of half cultivation. Mr. Cameron of Mysore speaks of the fruit as globose, the size of a large current, and as eaten only by the hill tribes. Dymock remarks that the TUBERS are rich in salts of potash and lime. When fresh they are acrid, owing to the mechanical irritation caused by the needles of oxalate of lime.

210 **V. lanata**, *Roxb.; Fl. Br. Ind., I., 651.*

Syn.—V. CORDIFOLIA, *Roth.*; V. HEYNEANA, *DC.*; V. RUGOSA, *Wall.*; V. LABRUSCA, *Linn. Var γ*; V. INDICA & PENTAGONA, *Hb. Ham.*; CISSUS VITIGINEA, *Roxb.* (*not Linn.*).

Vern.—*Kolo, kolo nari*, SANTAL.; *Jarila-lara*, PAHARIA; *Mikrum-rik* LEPCHA; *Asanjiya* or *asoja, pahár-phuta* (or *mountain splitter*) *purain*, KUMAON.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 222; Brandis, For. Fl. 99; Kurz, For. Fl. Burm., I., 277; Gamble, Man. Timb., 93; Cat. Trees, Shrubs, etc., Darjeeling, 20; Atkinson, Ec. Prod. N.-W. Prov. Pt. V., 56; Him. Dist., X., 307; Gazetteer, N.-W. P., IV., lxx.*

Habitat.—A very variable plant in the size, shape, and vestiture of the leaves. Met with in the Himálaya, at altitudes from 1,000 to 7,000 feet; also in the hills of Eastern Bengal, the Circars, and Burma.

FOOD. Wild Grapes 211 Conf. with pp. 256, 259-60, 263, 269, 275.

Food.—This is one of the chief sources of the small WILD GRAPES to be met with here and there all over India. The other species are V. indica, and V. parvifolia. Atkinson says of the present plant that in Kumaon and Garhwal the names *asanjiya* or *pahar-phuta* denote the variety rugosa "the grapes of which are edible and ripen in September-October, hence the first vernacular name. The grapes of *purain* (the form of lanata proper) are small, about the size of a black current, and are unpalateable." (*Conf.* with remarks regarding Grapes below, pp. 259-60, 263-4, 270, 271-2, 274, 275, 278, 279, 282, 284, 285, 232, 235.) Mr. Campbell says of V. lanata that the ROOT is eaten.

Root. 212

Vitis latifolia, *Roxb.*; *Fl. Br. Ind.*, *I.*, 652.

213

Syn.—V. KLEINII *Wall.*, V GLABRATA, *Heyne*; V. INDICA, *Wall.*; V. ZEYLANICA, *Russell.*

Vern.—*Goulia*, BENG; *I'c ewer, ic'er*, SANTAL, *Bédisa tiva*, TEL.; *Musal*, MERWARA; *Chin-douk-nway-zouk*, BURM.

References.—*Roxb., Fl. Ind, Ed. C.B C., 222; Brandis, For Fl., 99; Gamble, Man Timb, 93, Kurz, For. Fl. Burma, I, 277, Elliot, Fl. Andhr., 24, Indian Forester, IV, 227, XII., app. 10, N.-W. Prov. Gas., IV., lxx; Bombay Gas. (Kanara), XV., 430*

Habitat.—A large, herbaceous climber, found in North-Western India, the Sub-Himálayan tract as far west as the Sutlej; frequent in Bengal and South India, also in Pegu, especially in the Sittang valley.

Food.—Though not specially mentioned as edible, the GRAPES are black and are largely eaten by birds if not by men.

FOOD Grapes. 214

V. Linnæi, *Wall.*; *Fl. Br. Ind. I*, 649.

Syn.—*Kurz, in his Forest Flora of Burma, Vol. I., 275,* endeavours to establish a form V. Linnæi, to which he refers V. repanda, *W. & A.*, of the *Flora of British India*. The writer is not in a position to be able to form an opinion on this subject, but as these forms (whether distinct or not) do not appear to be of any very great economic value (so far as is at present known), it is only necessary to provide a place for them provisionally. Elliot (*Fl. Andhr., 23,39,181*) gives, to what he calls V Linnaei, the names *tige gummudu, china mandala mari* and *banka-baddu*, Telegu. Kurz tells us that his Burmese plant is known as *yin-noung-nway*, and that it is frequent all over Burma. The berries are said to be purplish black. V. repanda, *W. & A.*, Gamble tells us, climbs over the tallest trees. It is known as *pani-lara*, PAHARIA; *thym-rik*, LEPCHA. The wood, he adds, is very soft and fibrous; it holds a very large quantity of water. The writer found his attendants, while travelling in Manipur, cutting the long trailing stems of a vine to amuse themselves watching the stream of water flowing therefrom.

V. parvifolia, *Roxb.*; *Fl. Br. Ind*, *I.*, 652.

215

HIMALAYAN WILD VINE.

Syn.—V. TRUNCATA, *Miq.*; V. VULPINA, *Linn*, var. γ; V. WALLICHII, [DC.

Vern.—*Barain*, KUMAON.

References.—*Roxb., Fl. Ind., Ed. C B.C., 222; Brandis, For. Fl., 99; Atkinson, Him. Dist., N.-W. P. Gas., X., 307; Agri-Horti. Soc. Ind., XIX, 9.*

Conf with pp. 259-60, 275, 291.

Habitat.—Roxburgh speaks of this as "a slender, perennial vine, of exactly the habit of the common grape vine," and that description, it may be said, is fully applicable. It is a grape-vine with small leaves and small black berries, found plentifully in the sub-temperate valleys of the North-Western Himálaya, from Kashmír to Nepal; also in Eastern Bengal.

Food.—The small black GRAPES are very sweet and delicately flavoured when ripe. They are regularly eaten by the Natives, and at the Simla Horticultural Society's shows were even exhibited as a small kind of grapes. The writer, as Secretary of that Society, had some opportunity of investigating this subject, and he believes that more careful study would

FOOD Grapes. 216

FOOD. reveal as a fact that many of the small black grapes sold at hill stations in India are derived from the wild or semi-cultivated states of V. parvifolia (the very small grapes) and of V. lanata var. rugosa (the larger sizes). If this suggestion proves correct it would seem probable that some light might be expected to be thrown on certain obscure points of the origin of V. vinifera. The large black grapes of Simla and Bashrh, referable to V. rugosa, have a most peculiar favour, which might be described as something between a black currant and a grape. In these localities the true grape is also grown, but from what the writer was able to learn by the inspection of imperfectly dried specimens supplied to him, he is of opinion that the study of the living plants in Bashrh, for example, might reveal the existence of cultivated hybrids (*Conf. with pp. 259-60*) between V. vinifera and V. lanata (*Conf. with p. 255*). If not actual hybrids it seems likely that graftings of the true grape on to one or other of the wild forms may have been practised in the production of some of the Bashrh vines.

217 **Vitis pedata,** *Vahl.; Fl. Br. Ind., I., 661.*

Syn.—CISSUS HEPTAPHYLLA, *Retz.*; C. PEDATA, *Lank.*; C. SERRATIFOLIA, *Hb. Rottl.*; MELOTHRIX ZEYLANICA, *Kæn.*

Vern.—*Goalilata*, BENG.; *Tungrútrikup*, LEPCHA; *Edakula, mandula, kannem, puli máda, káni ápa tige, kádepatige*, TEL.; *Gorpadvel*, MAR.; *Mediya-wel*, SINH; *Godhápadi*, SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 138; Dalz. & Gibs., Bomb.Fl., 40; Grah., Cat. Bomb. Pl., 33; Elliot, Fl. Andhr, 49, 81, 82, 158; Gamble, List of Trees, Shrubs, etc., Darjeeling, 21; Kurz, For. Fl. Burm., I., 273; U. C. Dutt, Mat. Med., Hindus, 298; Rheede, Hort. Mal. VII., t. 10; Pharmacog. Indica, I., 365; Trimen, Cat. Ceyl. Pl., 19.*

Habitat.—A large, weak climber, met with in Bengal, Sylhet, Assam, the Khásia hills, Burma; also the Western Peninsula from the Concan southwards to Ceylon.

MEDICINE. Plant. 218 Medicine.—This species appears to be sometimes used as a substitute for or adulterant of V. setosa. The Sanskrit name denotes a resemblance of the leaf to the foot of the Iguana. According to the authors of the *Pharmacographia Indica* this PLANT is used as a domestic medicine because of its astringency.

219 **V. quadrangularis,** *Wall.; Fl. Br. Ind., I., 645; Wight, Ic., t., 51.*

THE EDIBLE-STEMMED VINE.

Syn.—CISSUS EDULIS, *Dalz.*; C. QUADRANGULARIS, *Linn.*; SŒLANTHES QUADRAGONOUS, *Forsk.*

Vern.—*Hár-jorá, hadjora, nallar, harsankar, kándawel*, HIND.; *Hasj ora, hórjórá, hárbhángá, har*, BENG.; *Hárbhángá*, URIYA; *Nallér*, DECCAN; *Harsankar, hárjorá, kándawel, nallar*, BOMB.; *Kándavela*, MAR.; *Harsankar, chódhári*, GUZ.; *Perundei codie, pirandai*, TAM.; *Nalléru, nullerútigeh*, TEL.; *Mangarúli*, KAN.; *Tsgangelam-parenda, viranta, piranta*, MALAY.; *Shazán-lese*, BURM.; *Hiressa*, SINH.; *Vajra-valli, asthisanhara*, SANS.; *Har*, PERS.; *Di-xanh-voung*, COCHIN-CHINESE.

References.—*DC., Prod., I.; Roxb., Fl. Ind., Ed. C.B.C, 136; Brandis, For. Fl., 100; Trimen, Sys. Cat. Cey. Pl., 19; Dalz. & Gibs., Bomb. Fl., 39, 40; Graham, Cat., Bomb. Pl., 33; Sir W. Elliot, Fl. Andhr., 129; Rheede, Hort. Mal., VII., t. 41; Ainslie, Mat. Ind., II., 303; Moodeen Sheriff, Supp. Pharm. Ind., 257, also Mat. Med. S. Ind. (in MSS.), 109; U. C. Dutt, Mat. Med. Hindus, 292; Sakharam Arjun, Cat. Bomb. Drugs, 215; Dymock, Mat. Med. W. Ind., 2nd Ed., 182; Dymock, Warden & Hooper, Pharmacog. Ind., Vol. I., 362; Drury, U. Pl. Ind., 443; Gazetteers:—N.-W. P., IV., lxx; Orissa, II., 181, App. VI.; Mysore and Coorg, I., 59; Agri.-Horti. Soc. Ind., Trans., VII., 53; Jour., IX., 411.*

Habitat.—A square-stemmed plant, found throughout the hotter parts of India, from the foot of the Western Himálaya in Kumaon, to Ceylon, and Malacca.

MEDICINE. Leaves. 220 Shoots. 221 Medicine.—The LEAVES and young SHOOTS when dried are powdered and given in bowel complaints (*Ainslie*). Forskal states that the Arabs,

when suffering from affections of the spine, make beds of the STEMS (*Graham*). This is the *asthisanhara* of Sanskrit writers (*Dutt*). Dymock says that the JUICE of the stem is dropped into the ear in otorrhœa, and into the nose in epistaxis, by the Marathas. It is also a remedy in scurvy and in irregular menstruation. In the latter disease, adds Dymock, "2 tolás of the juice, extracted by heating the plant, is mixed with 2 tolás of *ghi*, and 1 tolá each of *gopichandan* and sugar, and given daily." The late Dr. Moodeen Sheriff, in his work on the Materia Medica of South India (which he unfortunately did not live to finish) speaks of a preserve of the stem prepared by boiling it in lime-water, as a useful stomachic.

MEDICINE. Stems. 222 Juice. 223

Food.—The STEMS of this vine are very generally eaten by the Natives of India in their curries. When young they are said to be very good, but as they get old they become very acid. The LEAVES and stems were greedily sought after during the Khandesh famine. The red BERRIES are said to be very acid.

FOOD. Stems. 224 Leaves. 225 Berries 226

SPECIAL OPINIONS.—§ "Tonic: Young shoots used in small quantity, cooked" (*Apothecary Thomas Ward, Madanapalle, Cuddapah*). "Used in dyspepsia in man, and in cattle disease" (*Native Surgeon T. Modoeliar, Chingleput*). "The young SHOOTS are lightly roasted and ground up into a chatney with other condiments and used as an appetiser and stomachic. The shoots are cut up into small pieces, put into a covered chatty or other earthen vessel, and placed over the fire until the contents are burnt to cinders. The ashes are then powdered and administered internally in cases of dyspepsia" (*Surgeon-Major D. R. Thomson, M.D., C.I.E., Madras*). "Used by the Madrasees as chatney" (*Surgeon-Major P. N. Mukherji, Cuttack, Orissa*).

Shoots. 227

Vitis setosa, *Wall.*; *Fl. Br. Ind.*, *I.*, *654*; *Wight*, *Ic.*, *t. 170*.

228

Syn.—CISSUS ACIDA, *Wall.*; C. SETOSA, *Roxb.*

Vern.—*Harmal*, HIND.; *Yek-gisam-ká-bachlá*, DEC.; *Kháj-goli-cha-vel*, MAR.; *Puli-perandai*, *puli-naravi*, TAM., *Barabutsali*, *barre bach-chali*, *warsi-pala*, *pulla bach-chali*, TEL.

The vernacular names and uses attributed to **V. carnosa** by many writers (and for the present retained above, page 212) should for the most part very probably be transferred to this species.

References.—*DC.*, *Prod.*, *I.*, *630*; *Roxb.*, *Fl. Ind.*, *Ed. C.B.C.*, *137*; *Dalz. & Gibs.*, *Bomb. Fl.*, *41*; *Sir W. Elliot*, *Fl. Andhr.*, *24*, *159*; *Ainslie*, *Mat. Med.*, *II.*, *326*; *O'Shaughnessy*, *Beng. Dispens.*, *254*; *Dymock*, *Mat. Med. W. Ind.*, *2nd Ed.*, *183*; *Drury*, *Useful Plants of India*, *443*; *Moodeen Sheriff*, *Mat. Med. S. Ind.*, *107*, *Pharmacog. Ind.*, *I.*, *365*.

Habitat.—Found in the Western Peninsula, from the Circars and Mysore southward.

Dye.—Ainslie remarks that the BERRIES (**C. acida**) "might be turned to account in dyeing, staining or colouring, from the appearance of the dark coloured lamp-black looking substance, which can be squeezed out of it."

DYE. Berries. 229

Medicine.—Every part of the plant is exceedingly acrid. The LEAVES, toasted and oiled, are applied to indolent tumours, to bring them to suppuration (*Roxb.*). The authors of the *Pharmacographia Indica* say that this plant "is sometimes applied as a domestic remedy to promote suppuration and assist in the extraction of Guinea-worms." Moodeen Sheriff remarks that it is a useful local stimulant in the form of a poultice. Is applied to sloughing and fœtid ulceration, and also in boils and small abscesses for the purpose of hastening suppuration. Is a good substitute for yeast poultice.

MEDICINE. Leaves. 230

The Grape-Vine.

231 **Vitis tomentosa,** *Heyne; Fl. Br. Ind., I., 650; Wight, Ill., I., t. 57.*

Syn.—V. LANATA & CINNAMOMEA, *Wall.*; V. TRIFIDA, *Roth.*; V. TERNATA & TRILOBA, *Heyne*; AMPELOPSIS? TERNATA, *DC.*

Vern.—*Ghora lidi,* SANTAL; *Atukula baddu,* TEL.

References.—*DC., Prod., I., 634; Kurz, For. Fl. Br. Burm., I., 227; Sir W. Elliot, Fl. Andhr., 18; Gazetteer, Bomb., XV., 430; Rev. A. Campbell, Chutia Nagpur Econ. Prod., No. 9498; Trimen, Cat. Ceylon Pl., 19.*

MEDICINE. Root. 232

Habitat.—A densely wooly climber, found in the Western Peninsula, from Canara southwards; also in Burma.

Medicine.—With the Santals the ROOT is deemed useful to allay swellings.

233 **V. vinifera,** *Linn.; Fl. Br. Ind., I., 652.*

THE VINE, ALSO GRAPES, *Eng.*; VIGNE, RAISINS, *Fr.*; WEINSTOCK, TRAUBEN, *Germ.*; GRAPPI, *It.*; UBAS, *Sp.*; UVAS, *Port.*; UVŒ, *Lat.*; UZUM, *Turk.*; RAISINS, *Eng.*; RAISINS SECS, *Fr.*; ROSINEN, *Germ.*; UVE PASSE, *It.*; PASAS, *Sp.*; PASSA, *Port.*; UVŒ PASSÆ, *Lat.*; ISSUM, *Rus.*

The English word GRAPE, in its original sense, seems to have denoted a hook (*grapa*, Sp., a hold-fast; *grappare*, It., to seize; *krapfe*, Middle High German, a hook); in its next meaning it became a cluster of grapes, and later on the sense altered and it became a single berry. The first conception was doubtless the outcome of the study of its clasping tendrils, and might have originated in every country and tongue where the plant grew, without in any way denoting a common origin either for the vine plant or for the word grape, in cognate languages.

Vern.—*Angúr, dákh, drakh,* (*raisins*=) *kismis, manakká,* HIND.; *Angúrphal, drakhyaluta,* (*raisins*=) *kismis, manakka,* BENG.; *Angúr,* C. P.; *Angúr, dákh,* (*raisins*=) *kismis, manakka,* N.-W. P.; *Angúr, dákh, burí, tanaur, talor dach, newala, dakki, dehla, mámre, gandeli, láning,* (*raisins*=) *sirishk, mitha,* PB.; *Kwar,* PUSHTU; *Angúr* (grapes), *tak* (the vine plant), AFG.; *Basho,* LADAKH; *Uzúm* (grapes), *kurk uzum* (raisins), *sirishk* (currants), TURKI; *Drákh,* SIND; *Drákh, abai,* (raisins=) *kishmish,* BOMB.; *Draksha,* MAR.; *Drakasha, darákh,* GUZ.; *Kodi-mun-dirrippazham, kodrimúndrie,* TAM.; *Draksha-pondu, góstani drákshá, dracha,* (raisins=) *kisumisuchettu,* TEL.; *Drakshi,* KAN.; *Buaangúr,* (raisins=) *zabib,* MALAY.; *Sabi-si, sa-pyih, sa-byit,* BURM.; *Muddrap, wælmidi, úwus,* SINH.; *Drákshá, mridviká* (raisins=*laghu-drákshá*), SANS.; *Ainab,* (raisins=) *zabib, mewiz,* ARAB.; *Angúr,* PERS.; *Pu-t'au,* (raisins=) *kan-pu-tau,* CHIN. (*Conf. with ver. names, p. 221.*)

References.—*DC., Prod., I., 633; Voigt, Hort. Sub. Cal., 29; Brandis, For. Fl., 98, 574; Kurz, For. Fl. Burm., I., 277; Gamble, Man. Timb., 93; Cat., Trees, Shrubs, etc., Darjeeling, 20; Dalz. & Gibs., Bomb. Fl., Suppl., 15; Stewart, Pb. Pl., 35, 36; Aitchison, Cat. Pb. and Sind Pl., 34; Kuram Valley Rept., Pt., I., 41; Rept. Pl. Coll. Afgh. Del. Com., 46; Western Afghanistan and N.-E. Persia, 218; Graham, Cat. Bomb. Pl., 33; Mason, Burma and Its People, 460, 742; Sir W. Elliot, Fl. Andhr., 47, 62, 91; Darwin, Animals and Plants under Domestication, I., 332-33, 375, 382, 395; II., 228, 278, 308, 313; De Candolle, Orig. Cult. Pl., 191; Hehn and Stallybrass, Culti. Pl. and Domestic Animals in their Migration from Asia to Europe, 69-84; Stocks, Rept. on Sind; Pharm. Ind., 57; British Pharm., 461-464; Fluck. & Hanb., Pharmacog., 159; U. S. Dispens., 15th Ed., 1506, 1522; Ainslie, Mat. Ind., I., 157, 333; O'Shaughnessy, Beng. Dispens., 251; Butler Medical Topog., Oudh and Sultanpur, 32; Moodeen Sheriff, Suppl. Pharm. Ind., 257; U. C. Dutt, Mat. Med. Hindus, 138, 297; Sakharam Arjun, Cat. Bomb. Drugs, 27; Murray, Pl. & Drugs, Sind., 78; Bidie, Cat. Raw Pr., Paris Exhb., 78; Bent. & Trim., Med. Pl., 66; Dymock, Mat. Med. W. Ind., 2nd Ed., 184-186; Dymock, Warden and Hooper, Pharmacog. Ind., Vol. I., 357; Trans. Med. & Phys. Soc. Bomb. (New Series) IV., (1857-58), 84; Birdwood, Bomb. Prod., 143, 144, 202, 242; Baden Powell, Pb. Pr., 271, 310-312, 334, 601; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 307,*

711; *Useful Pl. Bomb.* (XXV., Bomb Gaz.), 150; *Econ. Prod N.-W. Prov.*, Pt. V. (*Vegetables, Spices, and Fruits*), 44, 55; Royle, *Prod. Res.*, 361, *Kew Bulletin*, 1889, 23, Simmonds, *Tropical Agriculture*, 426, *Official Correspondence*, dated May and June, 1890, *Proceedings*, *Rev. and Agri. Dept.*, April, 1890; *Ayeen Akbary*, Gladwin's *Trans.*, I, 81, 83, 86; II, 30, 37, 39, 44, 47, 69, 135, 174, 175; *Ain-i-Akbari*, Blockmann's *Trans.*, I, 65, Linschoten, *Voyage to East Indies* (Ed. Burnell, Tiele and Yule), I, 10, 103, 144, II, 266, 278; Davies, *Trade and Resources*, N.-W. Boundary, India, lxxxvii, cxxvi, clix; *Man. Madras Adm.*, II, 52, Nicholson, *Man. Coimbatore*, 241, *Bomb. Manual of Revenue Accounts*, 102, *Bomb. Admin. Rept.* (1871-72), 374, *Settlement Report* — Panjab, Gujrat, 135, Hazara, 94; Kangra, 22, 44, Kohat, 30, Simla, app. xlii, *Central Provinces*, Mandlah, 89, Nimar, 200, *Gazetteers* — Bombay, XII, 177, XVI, 102, XVII, 274-276, XVIII, ii., 62, 63, XXI, 387; Panjab, Hazara, 131, 133, Jhelam, 108, Peshawar, 18, Simla, 11, N.-W. P., IV., lxx., VI., 247; Mysore and Coorg, I, 53, 59, III, 48, *Agri-Horti. Soc. Ind.* — *Trans.*, I., 65, 96, 97, 105, II., 78, 202-205, app., 298, *Pro.*, 340, III., 41, 67, 68, 102; *Pro.*, 250, V, 69, *Pro.*, 84, VI., 54, 55, 61-70, *Pro.*, 52, 55, VII., 53, *Pro.*, 39, 84, 101, 150, 151, 183, 184, VIII., *Pro.*, 378, 398, 407, *Jour.*, I, 294-296; II., *Pro.*, 266, III, 89-94; *Pro.*, 40, 185, 196; IV, *Sel.*, 121, V, *Pro.*, 29, 42; VI, *Sel.*, 112; *Pro.*, 41; VII, *Sel.*, 7; VIII, *Pro.*, 180, 181; IX., *Pro.*, 147, 209, XI., 247, 248, *Pro.*, 54, 57, XIII, 382, 386; *New Series*, VII., 264-267; *Tropical Agriculturist* (1881-82), 16, 26, 146, 774, 1024, (1882-83), 447, 491, 499, 502, 527, 536, 570-572, 617, 618; (1885-86), 69, 70, 444, 484, (1886-87), 176, 336, 444, 587, 629, 676, 758; (1887-88), 129, 232, 622, 736, 752, 702, 791; (1888-89), 431, 457, 472, *Indian Forester*, IX, 170, *Quarterly Journal of Agriculture* (1861-62), X, 547; *Indian Agriculturist*, 2nd March 1889, 20th July 1889, 30th November 1889, *Encyclop. Brit.*, IX., 92; XII., 277; XX., 258, 520, XXIV, 237, 601, 611; Balfour, *Cyclop. Ind.*, I., 1425, III., 343, 1018, 1028, 1077; Ure, *Dict. Indus. Arts & Man.*, III., 1067-1087, Smith, *Ec. Dict.*, 429, 430.

Habitat — According to **Lawson** in the *Flora of British India*, this species is "perhaps wild in the North-West India, and rarely in the North-West Himalaya; cultivated extensively in North-West India, and rarely in the Peninsula and Ceylon." Lawson, however, adds that, according to **Regel**, the cultivated grape-vine is a hybrid between **V. vulpina**, *Linn.*, and **V. Labrusca**, *Linn.*, two American species, which he (Regel) identifies with the Indian **V. parvifolia**, *Roxb.*, and **V. lanata**, *Roxb.* Speaking of the American vines, **Darwin**, however, says that they "belong to a distinct species." The spirit of Darwin's observations is directed in support of the belief that, though extremely variable under domestication, the vines of Europe are not likely to be of hybrid origin. The grape sows itself freely in Southern Europe, some of the forms reproduce their special properties when raised by seed; Knight's attempts to cross-fertilize certain forms have not been successful in producing intermediary conditions nor new properties, although this has been accomplished by grafting. So, again, the extreme liability to variation has been proved by the multitude of sports found in the seedlings where crossing had been prevented. The chief variations noticeable may be said to be mainly in conformity with acclimatisation. **Simon** classed grapes in two sections, according as the leaves are glabrous or tomentose. Other writers have founded their classification on the shape and colour of the berries. **Odart** had resort to a purely geographical system. Some grapes require a dry soil, others luxuriate under prolonged humidity. Certain forms have brittle, others tough stalks which resist wind. In liability to disease, remarkable differences have been noticed: the Chasselas group were seen to be all readily affected, while the American very largely escaped

Conf. with pp. (for wild and indigenous cultivated edible vines) 254, 255, 263, 270, 272, 273, 275, 278, 284, 285, 291.

Hybrids *versus* Graftings. 234

In his chapter on the *Laws of Variation*, **Darwin** says "the line of practical culture has retreated a little southward since the middle ages; but this seems due to commerce, including that of wine, being now freer or

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more easy. Nevertheless the fact of the vine not having spread northwards shows that acclimatisation has made no progress during several centuries. There is, however, a marked difference in the constitution of the several varieties—some being hardy, whilst others, like the Muscat of Alexandria, require a very high temperature to come to perfection. According to Labat, vines taken from France to the West Indies succeed with extreme difficulty, whilst those imported from Madeira, or the Canary Islands, thrive admirably." As with most other plants so with the vine, acclimatisation must be undertaken by easy stages, not sudden translations. To attempt to convey the vines of the northern sections of the European area of cultivation to the tropical plains of India would be to court absolute failure, at least in the preservation of special characteristics. Any such object can only be attained by a slow process of gradual acclimatisation from country to country in easy stages. That object might, however, be more readily accomplished than were the reverse course desired, namely, to convey a tropical form to a temperate zone. According to most authors the vine, whether it be viewed as a multiplicity of forms from one common species, or the result of ancient hybridisation and grafting between two or more species, was originally a native of Western Asia. Acclimatisation, therefore, into colder regions must of necessity be slower and more difficult than a return towards the conditions of its presumed original habitat.

Conf. with p. 271.

Hybridisation and Grafting.

While the writer is not prepared to agree with the statement made above, that **Vitis vinifera** is "perhaps wild in the North-West Himálaya" (*Conf. with p. 264*), he has seen it growing in the vicinity of gardens, in a neglected condition. But what has already been stated is, he ventures to think, a prognostication of future interesting discoveries, namely, that the fruits of **V. rugosa** and **V. parvifolia** constitute a large proportion of the small dark-coloured grapes often sold at Himálayan stations (*Conf. with p. 256*). These plants may, in fact, be frequently seen in quite as great a degree of cultivation as the true vine. Indeed, the writer would be prepared to venture even further, and suggest that future study may likely discover hybrid states between **V. rugosa** and **V. parvifolia**, extensively cultivated under the conviction that they are the true grape-vine. It must not, however, be forgotten that many writers regard hybridisation as a much less powerful agent than grafting (if even it be an agent at all) in the production of cultivated states of the species of **Vitis**. The writer's attention was first directed to the possibility of the wild species yielding grapes, in connection with the Flower and Fruit shows held by the Horticultural Society of Simla. Prizes were offered for Native-grown fruits. Wild, semi-wild, and cultivated grapes were, accordingly, presented for competition. Among these, unmistakable forms both of **V. rugosa** and of **V. parvifolia** were shown, as also certain that appeared transitionary states between these two species. The peculiarities of the seeds of these semi-cultivated grapes left little room for doubt but that they were perfectly distinct botanically from the large grapes shown from the green-houses of the European growers. As bearing on the possibility of India, like America, possessing more than one species of grape-yielding vine, the reader will find the passage quoted below, regarding the wild grapes of Kashmír peculiarly instructive (*see p. 271-3*). The subject of the Himálayan grapes would, therefore, seem well worthy of careful study, as it may not only throw light on the nature of the disease alluded to (in the papers below) as threatening the once prosperous industry of vine growing in Kanáwar, but it may even extend its beneficial influence to the vine industry of the world. It may, in fact, have been with some such benefit in view that French growers, a few years ago, procured stock of the vines of Kashmír. There can be no doubt, however, that the study of the Himálayan and Central Asiatic grapes is more likely to be productive of good results than the investi-

Indigenous Vines.

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Conf. with pp. 255, 263-4, 270-1, 274, 275, 278, 279, 282, 284, 285.

The Grape-Vine. (G. Watt) VITIS vinifera.

gation of the degraded forms of the true vine, presently to be found on

branches of the industry need not be despaired of. Sufficient may, therefore, be accepted as already denoted to justify the inclusion of India in the world's area of vine cultivation.

MEDICINE, Fruits. 236 Raisins. 237

thirst, heat of body, cough, hoarseness, and consumption. Raisins also enter into the composition of numerous demulcent and expectorant medicines." Dutt describes the preparation of a medicinal wine known as *Drákshá arishta*, of which the chief ingredients are raisins, treacle, cinna-

Aglaia

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sump-

rmacy

ncture

of senna, on account of the saccharine matter they contain. Grapes are described by Dioscorides under the name of σταφυλη, raisins as σταφίς. Pliny speaks of *Uvæ*, grapes, and *Acini passi*, raisins. Argol (or the tartrate crust obtained from wine vessels) was the τρυξοινου of the Greeks, the *Fæx vini* of Latin, and the *Milh-el-tartir* of the Arabs. Noureddeen

simply *Sherab*, PERS. Wine by the Muhammadan physicians was a hot and dry cordial. Raisins

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without seeds, were known as *Ze-bír* in ARAB.; *Kishmish*, in HIND.; and *Mewiz* in PERS.; they were regarded as emollient and suppurative. Abdullah Shirazy adds that the vine plant was in Arabic *Kerm.*

The Muhammadan writers regarded the fruit as one of the most digestible, purifying the blood, and increasing its quantity and quality. Dymock tells us that "The ASHES of the wood are recommended as a preventative of stone in the bladder, cold swellings of the testes, and piles; in the two last named diseases they are to be applied externally as well as given internally. The JUICE of unripe grapes, *Husrum*, ARAB.; *Ghúreh*, PERS., is used as an astringent. It is the ὀμφάκιον of Dioscorides, and the *Agresto* of the modern Italians, who still use it in affections of the throat."

Ashes 238

Juice 239

"The *sharbat*, or syrup of grapes, says Moodeen Sheriff, is a very pleasant and cooling drink, and proves very useful in relieving thirst and other pyrexial symptoms in many forms of fever. I have also used it with advantage in ardor-urinæ, dysuria, strangury, and some cases of bilious dyspepsia. It is one of the best and most agreeable vehicles for other medicines, particularly those used in dyspepsia, dysentery, diarrhœa and dropsical affections. From their combined actions of demulcent, expectorant and laxative, raisins are a frequent ingredient in Muhammadan prescriptions for catarrhal and febrile complaints" (*MSS. of Mat. Med. South Ind.*).

"The cut branches of the vine yield in spring an abundant SAP, which was formerly used as a remedy for skin diseases, and is still a popular remedy in Europe for ophthalmia" (*Pharmacog. Ind.*).

Sap. 240

VINEGAR or *Angúr-ki-sirkha* is the expressed juice exposed in the air till it ferments. It is used as an acid drink in indigestion and cholic, and sometimes even in cholera. Mixed with salt it acts as an emetic (*Baden Powell*). (*Conf. with Vol. I.*, 72—78.)

Vinegar. 241

SPECIAL OPINIONS.—§ "'*Manakka*' and '*Kismis*' are different species. The former are regarded as cooling and laxative" (*Assistant Surgeon Shib Chandra Bhattacharji, Chanda, Central Provinces*). "Grapes are largely imported from Afghanistan. The fresh fruit is grateful and useful in allaying thirst in febrile condition" (*Brigade Surgeon, G. A. Watson, Allahabad*). "*Zirishk-i-shirin* is the term in Leh for the English equivalent, (*Zanti*) currants that are produced in Iskardo, where they are called *Basho.* See **Berberis vulgaris**, Vol. I., 446" (*Surgeon-Major J. E. T. Aitchison, C.I.E.*).

FOOD. Fresh Fruit. 242

Food.—It is perhaps scarcely necessary to mention in this place that the FRESH FRUIT is largely eaten in all countries where the vine grows. So very highly is this fruit valued that in countries where the vine cannot be grown in the open air, special glass-houses are constructed for its cultivation. And to so great perfection has this (what might be called artificial) production been carried, that some of the most highly prized forms of the fruit have been produced under glass. Indeed it is mainly to the growers of this class that the world looks for the yearly increasing list of new and valued forms. The manufactures of the grape are briefly WINE, BRANDY, VINEGAR, RAISINS, AND CURRANTS. These products will be found dealt with below in the special paragraphs devoted to them, at least in so far as India is concerned. The present section is, therefore, intended to preserve the logical position only for the names of the chief edible products of the vine.

WINE.

WINE. 243

VIN, *Fr.*; WEIN, *Ger.*; OINOS, *Gr.*; VINO, *It.*, *Sp.*; VINUM, *Lat.*; VINHO, *Port.*; WINO, WINO-GRADNŒ, *Rus.*

Vern.—*Sharáb, angúri, kishmishi, arak*, HIND.; *Madyá, madh*, BENG.; *Sheo* (wine), *rak, arrak* (brandy), KANAWAR; *Sharáb*, N.-W. P.; *Sharáb*, PB.; *Angúri*, SIND.; *Sarayam*, TAM.; *Sarayi*, TEL.; *Bu-*

and of Wine. (G. Watt.) | VITIS vinifera.

angur, MALAY ; *Isa-pyit-ya*, BURM. ; *Tsiu*, CHINESE ; *Draksha-rasa*, *madira* (*maddhika*, brandy), SANS , *Inub*, *khamr*, *wain*, ARAB ; *Sharáb*, *mei*, PERS.

HISTORY OF THE VINE & OF WINE.

HISTORY. 244

guished in Lecture XI., 95 Atkinson (*Himalayan Districts*) remarks that "the vines and apricots of Kanáwar are much praised in the Puranas" Kanáwar at the present day may be said to be one of the chief Indian localities where viticulture is a recognised industry, and one upon which the people are to a large extent dependent. The cultivation of the grape in Afghanistan, Baluchistan and Kashmir can also be carried into the most ancient records of these countries, and, at the present day, the trade in the produce of the vineyards of these regions is of no mean importance. The possession of an extensive vocabulary of names, both in

given in connection with Kashmír. But it may be said that in addition to political agencies the appearance of disease, due very largely to over-cultivation, has also modified or even ruined the industry in certain
's. The importance
in India, and the
gin of the industry,
tewart, than whom

Conf with pp. 254-5.

and Yarkand. In Kanáwar a spirit prepared from the juice is compared to grape brandy by Hoffmeister. This spirit is, according to Longden, called *rak* or *arrak*, and he mentions that a wine also (*Sheo*) is made there. The circumstance that the Hindu name is applied to this and the barley spirit of Lahoul would seem to imply, that the art of distillation

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had been introduced into these countries from below. In Afghanistan Bellew states that a grape wine is prepared, which is consumed by well-to-do Mussalmans, and a raisin wine for Hindus." Dr. Henderson remarks that the vine thrives in many parts of the Panjab quite as well as in Europe, and that, in his opinion, it is indigenous to Hazara, and, possibly also, to the Salt Range. Without more direct evidence in support of that opinion, it would perhaps be safer, however, to suppose that Henderson's wild Hazara vines were in reality one or other of the allied species to which reference has already been made. Henderson, in his *Lahore to Yarkhand*, says that "grapes of excellent quality are grown extensively in Yarkand, but not for making wine. In Ladak I got large bunches of black seedless grapes, the size of the Zante currant, but usually with one or two large grapes with seeds on each bunch. They were said to come from Skardo and to be exported in the dried state to Simla and the Panjab in large quantities."

Conf. with p. 275.

As giving still further an idea of the importance of the vine cultivation in the countries bordering on the North-Western frontier of India, the following passage may be taken from Aitchison's *Notes on the Products of Western Afghanistan and North-Eastern Persia*: "The vine, *tak*; the fruit grapes, *angúr*; raisins, *kishmish*; currants or corinths, *sirishk-shírın*; wine, *sharáb*; spirits made from raisnis, *arak*; vinegar, *sirka*; syrup of grape-juice, *shíra*; sugar made from grape-juice, *kand-i-shira-ghi*. The vine is cultivated wherever there is a garden. At Herat and Meshad large gardens contain ground laid out in vines alone; usually these are all trained as climbers, but at Bezel I saw some gardens in which were cultivated standard vines. The fruit is very variable in quality. The grapes of Herat are considered to be the finest. In Herat and its vicinity the largest amount of raisins is preserved, and much of both wine and spirits prepared. Throughout the country generally a syrup or very thin treacle is made from the juice of the grape; this is much eaten by the people along with their food, and is a great improvement when added to their usual coarse bread. Grapes and raisins, more particularly the latter, form a great export trade to India." In another part of his most useful little book, Dr. Aitchison says that of raisins (*kishmish*) two well marked kinds are prepared—the red, *surkh*, and the green, *sabz*. In his still earlier work (*Hand-Book of the Trade Products of Leh*) he tells us that in Yarkand grapes are called *úzúm*, a word which recalls the Russian *issum*. He further remarks that there are four chief varieties, viz., *kúk úzúm* or green grapes: *yeshil úzúm*, also a green grape: *kassil úzúm*, a red grape: and *harah úzúm*, an almost black kind. Raisins are called in Turki *kurk úzúm*, and the currants of Iskardo are *sirishk*.

Standard Vines.

Conf. with p. 266.

Raisins.

Conf. with pp. 267, 269, 274, 283.

In order to exemplify the extensive and diversified knowledge that exists in India and its chief frontier countries regarding the vine, a whole volume of quotations might be furnished. But the influence of that contention on the history of the Indian vines may, perhaps, have been sufficiently shown by the passages already given. While, therefore, vine cultivation exists at the present day in India—and there is abundant evidence that the plant and its products have been known for perhaps 3,000 years—there is nothing to show that during any period of this country's history did viticulture attain the proportions it assumed in the Greek and Roman ages of Europe. Still less can the idea be entertained that vine culture emanated from the country of the early Sanskrit-speaking race, although there is a probability that grapes of a kind were grown in Southern Asia, from an indigenous stock, prior to the introduction of the superior qualities from the Semitic home of the vine of present European agriculture. Prior to the Muhammadan conquests of India we possess, however,

HISTORY.

[illegible]

The more direct historic facts regarding Indian vines must, however, be [illegible]

[illegible] industry, but will be seen to mark the birth-places of the chief varieties of the vine, and of the systems of cultivation :—

[illegible] south-east, and to the deserts and paradises of the south-west, where we alternately find them settled, and developing the peculiar civilization which succeeded the Egyptian and long preceded the Aryan. To the Semites, then, who even invented

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the distillation of alcohol, who accomplished the gigantic abstractions [illegible] measurement, money, and alphabetic writing (a kind of mental [illegible] threshold of which the Egyptians had halted), belongs also [illegible] having arrested the juice of the grape at the stage of fermentation, [illegible] an exhilarating or stupefying beverage. From Syria the cultivation [illegible] to the Lydians, Phrygians, Mysians, and other Iranian or half Iranian [illegible] had, in the meantime, moved up from the east. Thus it entered the Greek [illegible] from the north, while at the same time Phœnician commerce, Carian [illegible] old Greek communities that had crossed from Europe to Asia, brought the [illegible] invention, and in time the plant itself, direct by sea. At the time of the Homeric [illegible] and Hesiod's poems, its introduction had long been accomplished [illegible] existence of the vine and of wine was taken for granted, and attributed, like all the blessings of life, to the instructions or the creating hand of a deity.

"The earliest voyages of the Greeks to the west must have introduced [illegible] cating beverage to the Italian coast, for that wine came to Italy from Greece [illegible] by the word *vinum*, its neuter form being accounted for by imitation of the [illegible] *voinon*. The Greek sailors found a simple shepherd folk, on whom the [illegible] had the same stupefying effect as on the Centaurs mentioned by Pindar: 'When the [illegible] Pheres became acquainted with the man-subduing power of sweet wine, they [illegible] pushed the white milk from the tables, drank out of silver horns, and [illegible] lessly about.' That in Latium milk was older than wine is proved by [illegible] attributed to Romulus, according to which white milk, and not wine, was to be poured out to the gods; and Numa decreed that wine should not be sprinkled [illegible] which shews that wine was not yet in use at the oldest funeral ceremonies. [illegible] was a time when the Romans only practised agriculture, and the cultivation of the vine had not yet been introduced. It is remarkable that in that country, as in Greece, legends of battles between the nations are connected with the introduction [illegible] A much noted legend relates that Mezentius, King of Cære, demanded [illegible] the first-fruits of their vineyards, or the first wine from the press, but that they [illegible] these things to Jupiter, and so won the victory over the wicked tyrant. [illegible] the Etruscans in Campania and Latium was probably broken by an alliance of the Greeks and Latins; and the faint remembrance of this victory [illegible] of the introduction of Greek viticulture and that of the institution [illegible] Jupiter Liber and Venus Libera. The 19th of August, the day of the [illegible] two temples to Murcia and Libitina, goddesses of the harvest, [illegible] day of the *vinalia rustica*, which was preceded on the 23rd of April by the [illegible] *priora*, both feasts connecting the younger cultivation of the vine with the [illegible] tion of the field. It was natural that Jupiter should be the patron [illegible] and that his priest, the Flemen Dialis, should [illegible] and fruits of the earth were attributed to that god. The [illegible] *him* the god of wine, is a translation from Greek; the Greek [illegible] Bacchus a *son* of Jupiter, had not taken root in Italy. The [illegible] riantly on the mountains of South Italy, that already in the [illegible] Sophocles calls Italy the favourite land of Bacchus, and Herodotus calls the southern point of Italy the land of vine-poles.

Standard and climbing vines
Conf. with *p. 264.*

Œnotria.—Œnotria was the land where the vine was trained [illegible] with Etruria and Campania, for instance, where it [illegible] and Spain, where it was cut short and left without support, [illegible] it spread roof-like over trellis work or cords; or [illegible] ground. These different methods of training resulted partly from the nature of the soil, which was either rocky and hot or damp and [illegible] of sufficient wood or cane, and partly from the [illegible] had been introduced, and the kind of grape they [illegible] of timber in the country afterwards called [illegible] from the cattle breeding connected with [illegible] use of proper vine poles, and the name [illegible] who were accustomed to train the vine freely [illegible] district at the mouth of the Po the vine [illegible] Greek maritime [illegible] to its cultivation. From Strabo [illegible] flourishing vines. [illegible] the poet Martial says [illegible] complains that a [illegible] water. [illegible]

(G. Watt)

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anciently connected with the mouth of the Po, is very early described as rich in wine. We read in **Polybius** that **Hannibal** cured the horses of his army with the old wine of that country, of which there was an abundance; and long afterwards the wines of Picenum were still exported to Gaul and the East There grew the celebrated Prætatian grapes, resembling the Istrian, and were identified by **Pliny** with the Pucinian grapes that grew on the river Timavus near Aquileia. The Picene vine had therefore been propagated from the old Greek times along the west coast of the Adriatic to the very head of that gulf. **Polybius**, who speaks as an eye-witness, praises the wine of the extensive and fertile plains that stretched from the Po to the foot of the Alps. Most likely the vine grew there already when the Celts invaded Italy, tempted by its southern wines and fruits. **Martial** speaks of the vine-covered slopes of the volcanic Euganean hills near Padua. The Rhœtian wines, that is, the wines of what is now Tyrol and Valtelin, were anciently celebrated They really owe their immortality to **Virgil**, who considered them only second to Falernian wine, but perhaps he eulogized the Rhœtian wine because **Augustus** particularly liked it **Strabo** joined in the song of praise, most likely echoing **Virgil**. The district of Verona, too, was celebrated long after for its wines."

"**Cato** was of opinion that of all kinds of culture that of the grape was the most profitable, and during the last years of the Roman Republic, Italy had become such a wine country that the relation between wine and corn was reversed, wine was exported and corn imported But the cultivation of the vine had also long since begun to cross the borders of Italy and make itself at home in the North and West." **Hehn** then shows the progress into France with Cæsar's conquest over the greater part of Europe. "At that time, he says, Gaul stood in relation to Italy, as Italy had stood in primitive times to Greece, and Greece before that to Syria, Phrygia, and Lydia. Gallic wines pleased the Italian palate. Burgandy was drunk, though not under that name." "Gallic varieties of grape, which had been produced by transplantation to new soils, were transmitted to Italy and propagated there The virtues ascribed to these Gallic vines entirely consist in greater resistance to an unfavourable climate, productiveness even on poor soil, and endurance of cold, rain, and wind; they all bear abundance of fruit, and yield a large quantity of *must*, they easily degenerate when removed to another soil, and have therefore no stable character; the grape called *helvennaca* does not thrive in Italy, but remains small and easily decays; the aroma of the Allobrogian wine is rapidly lost and so on." "It was in the natural course of things that during the Empire the culture of the vine should not only become permanent in Gaul, but be extended to the valleys of the Garonne, the Marne, and the Moselle, though it did not as yet cross the Rhine. But, if not the vine, yet wine itself soon became known to the neighbouring Germans, who by their acceptance of this product concluded the fateful compact with Gallic Roman civilization." "The cultivation of the vine in the Roman provinces threatened to choke the cultivation of grain to such a degree that the Emperor **Domitian** in an excess of anxiety, ordered that half and more than half of all the vineyards outside Italy should be destroyed—which order, naturally, could not be carried out. Prohibition of the Oriental custom of castration being issued about the same time, **Apollonius** said that the Emperor spared men but eunuchized the earth."

"If we compare the present condition of viticulture with what it was in ancient times, we find that it has in some degree followed the general course of history, that is, it has declined in the countries of its origin, and stands at the … point of development in those countries where it was introd… stern Asia, the cradle of the vine, was … m, it was natural … onquerors, … nment—in … "Modern … degrada- … olian, Lesbian, … rhaps *currants* are only a variety of … uon. They are said to have come from the Isle of Naxos … ve been unknown in the Morea before 1600. It is remarkable that they … sander, as it were, from place to place. They haye disappeared from Naxos, exist no longer at Corinth whence they received their name, and are now only found in Patras, … ante, and Cephalonia."

But after the fall of the Roman Empire Italian viticulture rapidly declined. The … bles and princes gradually came to care more for quantity than quality. It was the … ste and wealth of the Roman nobles that had nurtured and developed the infinite

Curra… *Conf. wit…* 264, 269, … 283.

VITIS vinifera.

History of the Vine and of Wine.

HISTORY.

variety and quality of the wines. Thus **Horace** made known the qualities of the wines of Latium and Campania under the names of Falernian, Massic and [illegible], but **Pliny**, two generations later, says that they were no longer valued. "Manufacturers of wine in Greece and Italy are now reproached with exactly the same thing." "It is universally admitted that in modern times the palm in the production of wine is due to Central and Southern France. Whilst Italy almost entirely consumes the thirty million hectolitres of her yearly produce, and has therefore little to spare for

Vine Louse. *Conf. with p. 290.*

export, France, on the contrary, till the vine-louse began its ravages, produced [illegible] the quantity at a money value of about 2,000 to 3,000 million francs, because [illegible] exporting country, supplying all parts of the world with the first wines as well as common table wines." "It is a remarkable fact that vines now produce the best wines in places close to the northern limit of their extension, where the plant was only gradually and with difficulty, and last of all acclimatised; wines now famed over the world under the names of Burgundy, Johannisberg, etc. Here, of course, [illegible] and technical skill have done their utmost; and who knows what they might not accomplish if adopted in the original homes of the vine? In this connection, a fact that meets our eyes in the first two or three centuries of the Middle Ages deserves [illegible]

Wines of Palestine.

attention. At that time, we find the western world thought of the wines of Palestine as the *strongest* and *finest*, just as we now quote the ports and sherries of the [illegible] peninsula; and the wine of the Phœnician-Philistine coast was greatly valued at the Byzantine court. It was the Arab invasion that put an end to [illegible] and the commerce founded upon it." After pointing to the results of [illegible] of the expansion of vine culture **Hehn** adds:—"Wine, we might say, [illegible] west, and clings to the neighbourhood of its old home." "At two points [illegible] and quite at the end of the Middle Ages has the hand of man really extended the region of the vine, namely, in Madeira and the Canaries—which may in a sense be said to belong still to Europe and the Mediterranean. **Prince Henry**, the [illegible], introduced shoots of the vine from the Peloponnesus and Crete into Madeira and **Alonza de Lungo** transplanted vines from Madeira to Teneriffe about the year

Grape fungus. *Conf. with p. 291.*

1507. The wine yielded there by Grecian grapes became celebrated all over the world, but lately the grape-fungus has destroyed this culture, and it is being [illegible] culty. But the cultivation of the vine in those islands is also interesting, because [illegible] comes nearest to the climate of the tropics; the vineyards even of [illegible] and of the Cape are further away from the equator than the [illegible] latitude."

The distribution of the vine throughout Europe is thus more or less a matter of historic record, although, as **DeCandolle** points out, the discovery of vine seeds in the lake-dwellings of Castione, Wangen and Switzerland carry a knowledge in the fruit into prehistoric times, a fact [illegible] by the existence of vine leaves in the tufa of Montpellier and [illegible] Meyrargue,—deposits certainly older than the historic [illegible] the tertiary epoch of geologists. "The dissemination by birds must have therefore begun very early, as soon as the fruit existed, [illegible] before the migration of the most ancient Asiatic peoples, perhaps [illegible] the existence of man in Europe or even in Asia. Nevertheless, the frequency of cultivation, and multitude of forms of [illegible] may have extended naturalization and introduced [illegible] varieties which originated in cultivation." "An [illegible] tation is more or less mythical, but [illegible] restricted are in accordance with the [illegible] areas more or less ancient and real, [illegible] tained itself wild, without the constant [illegible] *dolle. Orig. Cult. Pl.*). To some [illegible] existence of the vine on the temperate [illegible] *Vitis vinifera* are not [illegible], though [illegible] having been a native [illegible] Asia, long anterior to its being cultivated [illegible] other [illegible] ancient times, grapes [illegible] having [illegible]

VITIS vinifera.

HISTORY

readily be supposed to have ceased to be cultivated on the introduction of the better qualities from the trans-Himálayan regions. That the earliest classic literature of India necessitates our acceptance of the vine or of a vine as having been known to the Sanskrit authors, is a matter upon which there can be little room for doubt. But we have to pass over a gap of many centuries before we obtain unmistakable evidence of its cultivation. There is, however, no ancient record of its introduction, and the classic and many of the vernacular names for it and for the preparations from it, seem purely spontaneous and bear little or no relation to the Semitic and European synonyms. **Victor Hehn** (in the passage quoted above) has very ably exemplified the effect of the conquests of Islam on the vine culture of the Mediterranean area, and it need scarcely be said that that power also dominated the arts and industries of the ancient peoples of this country for fully a thousand years. Is it matter for surprise therefore that the possibilities of India in the production of grapes and wine are still unsolved. So far as the experiments have gone, it may indeed be said they are hopeful in the highest degree. But that viticulture should have survived in Kanáwar (in the North-West Himálaya) in spite of the great disadvantages under which it has laboured, would seem to show that India need not confine her expectations of a future production of wine to the vale of Kashmír, nor regard increased facilities of trade with Afghánistán as essential to an expansion of her supplies of grapes, raisins and currants. The somewhat curious fact that the vineyards of Kanáwar (even to the present day) find an outlet for their raisins and currants in Tibet, illustrates no doubt the conservative nature of trade, but it confirms also the idea of the Muhammadan persecution of viticulture that for many centuries prevailed in the East. The simple cultivators of the higher fertile valleys of the Himálaya had either to abandon vine growing or had to seek seclusion rather than to court publicity for their industry. Is it to be wondered at, therefore, that few persons have thought of India as possessing vineyards or have heard even of the fact that *for centuries* she has produced within her own territory wine of so excellent a quality that it needs but the skill and experience of the West to place it among the commercial products of this vast empire.

Conf. with pp. 255, 274.

Currants. *Conf. with p. 283 et seq.*

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It is neither within the scope of this article to discuss the methods of vine culture practised in Europe, nor to deal with the forms of the plant so cultivated. Persons interested in these subjects will have no difficulty in procuring an extensive series of technical works. What more especially concerns the writer is to furnish such information as can be procured on the present vine industry of India, incomplete and fragmentary though the literature of that subject most undoubtedly is. The imperfections of the systems pursued and the unsatisfactory position of the industry, when fully made known, may, in the writer's opinion, very likely act as greater incentives to reform and progression than would an essay on Viticulture in general. This object cannot perhaps be better accomplished than by furnishing, province by province, a few passages from local works and official correspondence, illustrative of the degree of knowledge that prevails, and of the extent of the experiments that have been made towards improvement. It will be seen that well on to half a century ago, the subject of vine growing on the plains of India, to some extent occupied public attention, but that since then it has been allowed to drop into almost complete obscurity, and, but for the revival of interest (within the past few years) that has been taken in wine production in Kashmír and the raisin trade of Kanáwar, it might almost be said that we know little more at present

Kashmir Wine *Conf. with pp. 261, 296.*

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than that some localities have the reputation of growing fairly good grapes, while in others that the humidity is said to prove too great for the successful rearing of the plant. The systematic study of the industry and the comparison of the results obtained, district by district by a qualified person, would doubtless remove much of the ignorance that prevails. At present, while we know that grapes of one quality are found here and of another quality there, we do not know for certain whether these differences proceed from climatic peculiarities, from the nature of the vines grown, or from the systems of cultivation pursued. We read of disease having once upon a time partially or totally ruined the industry in one locality and of devastation threatening another now; but in both cases we are alike unable to tell for certain whether it was or is due to fungoid or to insect depredations. We are accordingly hopelessly unable to recommend curative or protective measures. Indeed, all that can be written amounts to this, that in few branches of Indian agriculture is the need for investigation more imperatively demanded. It is not enough to know that vines are grown in India or can be grown. False hopes may have been even raised by what has been said in this article. We require to have it proved whether or not there is in the viticulture of India the inherent property necessary for commercial success.

Conf. with pp. 274 289.

Panjab.

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According to Mr. Baden Powell, "There are several varieties of grapes recognized in the Panjáb. The first is '*Kándaharí*,' being a purple grape. 2nd, the '*Kishmishi*,' small seedless grape (producing what are called in England 'Sultána Raisins'), these are of the varieties called '*Sahibí surkh*', and '*Sahibí ablak*'; the Khatan grapes produce the large common raisins, called '*Munakka*'. 3rd '*Gholab dan*,' a white grape. 4th '*Husaini*,' these are the grapes that come to Lahore from Kabul, in round boxes packed in cotton wool. 5th, '*Sahibí*,' a superior grape (white). 6th, '*Fakhri*,' sometimes called '*askari*,' a black grape. 7th '*Munakka*' and '*abjosh munakka*,' are grapes dried in the sun; to make *abjosh* the grapes are plunged into boiling water, and then dried in the shade. 8th, '*Rísh bábá*.' 9th, '*Didah-i-gau*,' a white grape, with some spots on the skin, which are said to resemble a cow's eye, hence its name; pious Hindus refuse to eat this grape on this account. 10th, '*Karghani*' (white) called from the name of a place. 11th, '*Angúr Jálálábádi*,' called also '*Khátta angúr*,' grown at Chárbagh, a few miles from Jálálábád And 12th, '*Cháranguv*,' grown also at Jálálábád." Mr. Baden Powell adds that the common grapes are known as *rocha-i-surkh* and *rocha-i-safed*, also *toran*. The white grapes sold in the cold season are the *hosaini* or *shaikh khalli*, and yet another the *akta* grape, which produces bloom raisins, called *dagh*, or more properly *kishímish-i-daghi* or *abjosh*, which are prepared by dipping the ripe bunches of fruit into a boiling solution of quicklime and potash (hence called *abjosh* or infused in water) before drying in the shade.

Indigenous Grapes. *Conf. with pp. 255, 259-60, 263-4, 271, 274, 275, 278, 279, 282, 284, 285-6.*

Dr. Henderson, whose opinion has been in part already quoted, says "that in many parts of the Panjáb, the vine thrives quite as well as in Europe." He adds, however, that its only fault is its tendency to grow to wood and leaves. "This tendency might probably be counteracted by proper cultivation and by choosing a poor rocky soil, and selecting suitable varieties of vine. There seems to be no good reason why, if the best vines are obtained, good wine should not be produced in many parts of the Panjáb, particularly in the hills on stony ground, where little else will grow. I am not aware that any attempt that has been made, on a large scale, to grow grapes in the Panjáb for the purpose of making wine. In the plains, the grape ripens at a season when the heat is prob-

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ably too great to allow the juice to ferment properly without turning acid, but in the hills this does not hold good, the difficulty there will be to get either a climate where there is little or no rain, or to get the fruit to ripen before the rains set in. In an old number of the Agri-Horticultural Society's Journal, to which I cannot at present refer, I recollect having seen a notice of a vine found in the south of India which ripens its fruit much earlier than the common vine of the country." The selection of forms, found to ripen their fruit more quickly or it may be later than others, has largely governed the production of some of the better known grapes of Europe, and doubtless some such process would result in much advantage to India. It is probable, however, that the translation of a plant from South India to the Panjáb would be attended with very nearly as serious departures from its recognised properties, as would occur in a vine taken from Italy or even France to the Panjáb, or of one sent from the Panjáb to Italy. Selection, to have permanent results, must be more restricted, at least in the first instance, than would be understood by Dr Henderson's allusion to Madras grapes. There can be no doubt, however, that the Panjáb possesses excellent stock to allow of a start being made in improvement of quality by natural and scientific methods.

Conf. with p. 260.

It is perhaps unnecessary to give the few scattered passages that occur in the Settlement Reports and Gazetteers on the subject of the Panjáb grapes. Those of Peshawar are said to be of excellent quality. The wild grapes of this district are spoken of as *kwar* in Pushtu. In Házara four or five kinds are grown; the inferior are called *kala dakh* and *Jogan*, and the superior *bedana* (seedless), and *munnaka*. They are specially mentioned also in connection with Kohat, Guzerat, and Simla. But it may be said the main interest in the grapes of Upper India centres in the Native State of Kashmír

Indigenous Grapes *Conf. with p. 270.*

KASHMIR.—Without calling in the aid of tradition or even that of ancient historic records, we possess information of two if not of three distinct efforts that have been made to place this Native State in the position of a wine-producing country. In the sixteenth century when the Emperor Akbar held his Court not infrequently in Kashmír, wine production would seem to have been a very general industry. Akbar took a personal interest in agricultural and horticultural improvements. Having learned from the foreign visitors to his Court of superior grains, fruits or flowers, he was in the habit of making efforts to procure these. As the result, many of the exotic plants now all but universally grown were originally brought to India by him. His historian speaks of the viticulture of Kashmír and Kábul in such terms as to lead us to suppose that he took as direct an interest in it as his successors are known to have persecuted the industry. "His Majesty, we read, looks upon fruits as one of the greatest gifts of the Creator, and he pays much attention to them." "Melons and grapes have become very plentiful and excellent." "Various kinds of grapes are to be had from *Khurdád* (May) to Amurdád (July), whilst the markets are stocked with Kashmír grapes during Shahriwar. Eight seers of grapes sell in Kashmír to one *dam*, and the cost of transport is R2 a maund. The Kahsmírians bring them on their backs in conical baskets which look very curious. From *Mihr* (September) till *Urdibihisht* grapes come from Kábul." "Whenever His Majesty drinks wine, etc." "Grapes though in abundance in Kashmír are but of few kinds and those indifferent. In general, they let the vines twist round the trunks of the mulberry trees." "The inhabitants chiefly live upon rice, fish, and dried fruits and vegetables; and they drink wine." These and other such like passages occur frequently, and in Blochmann's translation we read of the numerous "grandees" at the Court of Akbar who were addicted to the use of wine

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(*See pp.* 323, 339, 345, 363, 364, 378, 407, 412, 426, 447, 464, 468, 470 485, 492, 518, 545, *etc.*). In Gladwin's Edition even more instructive particulars regarding the grapes of Kashmír are given, which indicate an almost universal cultivation. "The revenue," we are for example, told, "was collected in grapes either by measurement, or by agreeing to pay a certain sum. For measurement some experienced persons estimate the produce of the vineyards and the State exacts four *baberies* for every *kherwar*. In the reign of Hemayun the rate was two *baberies* and four *tunqhas*. A *babery* is one *miskal;* two and a half *baberies* are equal to one rupee. Besides these three (barley, wheat, and grapes) which are called *safeidtery*, there are taken upon the following articles, which are styled *subting* (or greens) seven and a half *baberies* for every *jereeb, viz.*, rice, melons, cucumbers, onions, turnips, carrots, poppies, and lettuce." It will thus be seen that the grape and the wine of Kashmír 300 years ago held a much more important place in Kashmír than at the present day.

Through the fostering care of the Emperor Akbar superior vines were also introduced into Lahore, Delhi, Agra, Allahabad, etc. During the reign of the Emperor Jahangir the grapes of Kashmír were improved, but very shortly after the decline set in which has been alluded to. Some idea may, however, be given of the position of the industry prior to the recent revival that has been undertaken. Mr. Moorcroft wrote in 1823 of the grapes he found in the State as follows:—Vines are of many varieties, both of exotic and indigenous origin; of the former are the *Moskha, Sahibí Husení* and *Kishmishí*, which last was introduced by the Emperor Jahangir from Kábul. The latter, or those indigenous and cultivated, are, *Pamuthil, Takrī, Upamahí, Bará kawar, Nika kawar, Kachíbúr kanahepí, Harduch* and *Kathu husnení*. The wild grapes are *Deza, Kuwaduch*, and *Umburbarī*. The four first are good, but it is said that those of similar name in *Kábul* are still better. The skirts of the southern face of the northern hills were formerly largely clothed with vines, and under Hindu rule much wine was made. The practice was continued to, or revived in, the reign of Jahangir. A little brandy is occasionally distilled, even now, and under suitable management might vie with cogniac. Speaking of brandy, it may be added that according to Mr. Baden Powell, some was formerly made in Lahore of which Ranjit Singh drank, often too immoderately. There is thus no doubt that the art of wine-making was known in Kashmír (and even in India) three hundred years ago, and that it was even an article of every day use with the people of that State during the time when Queen Elizabeth ruled the destinies of England. Carrying the history of this subject, therefore, down to the present time we learn that whatever progress had been made in the sixteenth century was all but completely effaced by the reign of Muhammadan bigotry and degeneration, that ultimately culminated in the overthrow of the Emperors of Delhi. The subject next assumes interest in 1876, when M. H. Dauvergne made wine from the indigenous grapes and reported his success to the Maharajah Ranbir Singh. Another gentleman was then in Kashmír, M. Ermiens (a Belgian traveller), who had had some previous experience in vine growing, and to him was entrusted the institution of experiments on a large scale. Plant to the value of R80,000 was imported or constructed locally, and in 1880 the first vineyard came into bearing. It was now, however, ascertained that M. Ermiens had in reality no knowledge of wine-making. The Maharajah accordingly procured the services of two other foreigners, M. Peychaud of Chateau Margaux, as wine-maker, and of M. Bonley of Paris as distiller. The management of the enterprise was entirely left in the hands of these French experts until 1882, when the Native official in charge of the Agri-

Indigenous Grapes of Kashmir. *Conf. with pp.* 255, 259-60, 263-4, 270-1, 274, 275, 278, 279, 282, 284, 285.

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Kashmir

cultural Department of the State succeeded in obtaining the transference of the vineyards to his supervision But the Maharajah, for some time after, continued to take an active personal interest in the enterprise Three new vineyards were planted, making a total of five, *viz.*, at Teed, Mashri Bagh, and Neshat Bagh A sixth, seventh, and eighth soon followed, until, as reported by Dewan Lakhpat Ray, there were in 1885 352,525 plants growing in the various vineyards (*Jour. Agri.-Hort. Soc. Ind.*, *III.*, 264-267). The heavy expenditure, with no return, began to tell, however, and apathy in time supervened. The industry in consequence soon fell into the hands of Native agencies and was then threatened with complete extinction. At this stage serious changes, however, took place in the State The Maharajah sought and obtained the assistance of the Indian Government in the administration of his country. The two best vines (introduced by the Maharajah)—that from Sauterne and from Medoc—had continued to flourish, and, according to numerous reports, had yielded quite as good fruit as in their original homes. The Indian Government, therefore, regarded the experiment, begun so admirably and which had attained so great a degree of success, as worthy of being continued. Accordingly a requisition was sent to Her Majesty's Secretary of State for the services of two Italian experts, to strengthen the staff still available in the State This resulted in the appointment (in 1890) of Messrs. Bassi and Benvenuti, who in that year took over charge of the duties assigned to them. It may thus be said that under the direct supervision of the Council of the Kashmir State, a fresh effort has been made, and one in which the whole of India may be viewed as deeply interested. The French experts, employed in the early phase of this experiment, have spoken in such high terms of the climate and soil of Kashmir, that it may safely be regarded that now that the danger of starvation through Court intrigues has been removed, the experiment may be looked upon as having obtained the opportunity desired, namely, of ascertaining whether wine production in Kashmir can or cannot be made a commercial success. If it can, the value of that State may not only be incalculably increased but it is possible that in Kullu and other parts of the North-West Himálaya, where a climate prevails similar to that of Kashmir, vineyards may soon blossom forth and a new industry take its birth, that may in the future astonish the world as completely as has that of tea. India can never very likely hope to take the place of France nor even of Italy as a wine-producing country, but if it succeeds to produce a wine that finds a ready sale, it will accomplish all that is at present aimed at, and in so doing it will give another shock to the European preconceived notion of this country as a land of tropical swamps, tiger infested jungles, and rice fields.

Wine. *Conf. with pp.* 261, 296.

It need scarcely be added that red and white wines, of a very superior quality, have already been produced in Kashmir. Its white wine obtained a gold medal at the Calcutta International Exhibition, and the samples of both wines shown at the Colonial and Indian Exhibition were highly commended by many persons well qualified to give an opinion.

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Although vines are cultivated here and there throughout these provinces, very little has been written of a definite nature regarding them It has already been said that Abul Fuzl speaks of Akbar having given to Agra, Allahabad, etc., grapes of a superior quality. So far as the writer can discover, the grapes grown in these localities at the present day are not much different, if different at all, from those to be found in other parts of these provinces. Atkinson, in his *Economic Products*, says: "Throughout the plains the vine fruits well in every district, those raised at Agra,

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North-West Provinces and Oudh.

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[illegible]

VITIS vinifera.

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VITICULTURE in the N.-W. P. & Oudh.

Allahabad, Benares, Cawnpore, and Lucknow being well known for their excellence." But these grapes are quite unsuited (even were the climate favourable) for wine manufacture. It may at once, therefore, be admitted that the most sanguine enthusiast is not likely to be found ready to urge the claims of the Gangetic plains as a hopeful field for extended viticulture. Indeed, it might almost be said that, except in gardens where special care is bestowed upon them, the vines grown in these provinces cannot be made to fruit very freely. On the hills it is otherwise, and the local interest in this subject may, therefore, be said to centre mostly in that portion of the Himálaya placed under the Government of these provinces. The conditions that prevail in Kumaon, Kanáwar, etc., are, however, so similar to those of portions of the neighbouring district of Simla (in the Panjáb) that the information available may be treated of conjointly in this place. As remarked by **Atkinson**, vine culture has been pursued in Kanáwar since the early classic periods. **Mr. Coldstream** (*Deputy Commissioner, Simla*) in a letter, dated 24th January 1890, recommends that a scientist be deputed to Kanáwar to study the vine disease "which has for the last thirty years been very destructive to the vineyards of that district, so much so indeed that this industry once extensive is now almost a thing of the past." This subject has accordingly been under the consideration of the Government of India, and it may not be out of place to furnish here one of the earliest (of what may be called the modern) reports on the Kanáwar vine industry. **Dr. Cleghorn**, in a paper on *Notes on the Vegetation of the Sutlej Valley* (*published Journ. Agri.-Hort. Soc. Ind., XIII., p. 382*), wrote in 1863 as follows:—

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"In Upper Kunáwar the vine is extensively cultivated and ripens its crop at an elevation of from 6,000 to 9,000 feet. The first plants are seen at Nachar, but the climate there is not suitable; beyond the Miru ridge which intercepts the heavy clouds, the smaller amount of rain favours the ripening of the grapes. The vineyards occupy sheltered situations, generally on the steep slope facing the river. The vines are supported on poles three or four feet from the ground, connected by horizontal ones. The fruit hangs below the shade of the leaves, never exposed to the sun. A considerable portion of the crop is dried on the house top and stored as raisins for winter use, but without care, and many grapes are spoiled in the process. For several years the crop has been deficient, the grapes dropping off before they were ripe from unseasonable falls of rain and snow. This year, 1864, the rainfall was moderate, but the *Oidium* or vine disease appeared in the valley and destroyed many vineyards. The fresh fruit is exported to Simla for sale in *kiltas* or large hill baskets, and the small seedless grapes dried are also sold there as 'fine Zante currants.' At Akpa and Poari the price of fresh grapes is about one rupee for a *kilta*-full. 'Sangam is the highest point in the valley where the vine thrives.'"

Manufacture of Raisins. *Conf. with pp. 283 et seq.*

Indigenous Grapes. *Conf. with p. 270.*

In Kanáwar, says **Mr. Atkinson**, the fruit is called *dakhang* and the plant *lánang*, and there the vine is extensively cultivated as a field crop and ripens its fruits at an elevation of from 6,000 to 9,000 feet. He adds, a spirit called *rak* or *ark* is prepared from the juice and a wine called *sheo*. **Sir D. Brandis** (*For. Fl.*, 98) says: "In India, extensive vineyards were formerly found in Kanáwar, from Jani to Sangnam (between 5,500 and 9,000 feet), and in some of the other inner and drier valleys of the North-West Himálaya. But the vine disease broke out in these secluded valleys (between 1855 and 1860), and since then the cultivation has greatly diminished." It will be seen that **Dr. Cleghorn** (in the passage above) affirms that the disease in question was **Oidium**, and therefore not the incurable insect pest **Phylloxera**. This is a point that urgently calls for investigation, but it may be pointed out that whatever be the disease that is at present destroying the Kanáwar vineyards, it was not likely to have been **Phylloxera** in 1855, since the louse only appeared in Europe in 1866, and in America in 1854. Some few years ago, when it was proposed to introduce the better qualities of the vines of France into Kashmír,

VITIS vinifera.

VITICULTURE in the N.-W. P. & OUDH.

Professor Maxime Cornu urged that rooted plants should certainly not be taken unless the insect-root-disease (**Phylloxera**) actually existed already in Kashmír. This point was accordingly referred to the Kashmír authorities and the reply came in the affirmative—the disease was already in the State. This definite statement must, therefore, be accepted, but the writer thinks it necessary that he should add that so far as the reports and correspondence which have been published are concerned, satisfactory proof has *not as yet* been given of the accuracy of the affirmation that **Phylloxera** is actually in Kashmír. It may be there now or may appear at any moment, for its progress throughout the area of viticulture has been almost unprecedented. Until we know for certain of its existence, however, by the publication of precise scientific reports, it may be affirmed that we possess at present only the vaguest generalizations regarding the vine diseases of India. That being so the extensive importation of the American vines, or indeed of any rooted vines, would seem highly impolitic and even unnecessary. To realize the full force of this remark, the reader has only to recall what has already been said under **Vitis lanata** and **V. parvifolia.** There are wild and semi-domesticated vines in India so nearly allied to the true **V. vinifera,** that a botanist is almost required to distinguish them. The *asaujiya* or *pahar-phuta*, for example, yields in Kumaon and Garhwal an edible grape. The question may, therefore, in all fairness, be asked—Have the indigenous species (wild or cultivated) shown symptoms of being attacked by **Phylloxera?** If they have not, the further question naturally suggests itself. Would it not be desirable (before attempting the acclimatisation of American mother-plants upon which to graft the true vine) to ascertain whether the indigenous wild stock would not serve the same purpose? The writer has already offered the suggestion that some of the wild forms of **Vitis,** found on the Himálaya, might easily have been the plants that yielded the grapes of the early writers prior to the introduction of the true vine. If there be any merit in that suggestion it would seem that India may not only be retarding her own natural development, as a vine-growing country, through neglecting these wild species, but that she may be depriving the world of the assistance she possibly could render, in the much needed renovation, so to speak, of the now exhausted and weakened stock of the wine-yielding grapes of Europe. In no other part of the globe where grapes and wine are produced has less interest at all events been taken in this great question than in India. We are alike ignorant as to whether we actually possess the diseases that have paralysed the wine industry of the world, or ...re in a position to assist in arresting the fatal tendencies of grape cultivation.

Conf. with p. 289.

Conf. with pp. 255, 256, 259-60, 263, 264.

Grafting *Conf. with pp 259, 260, 277.*

Conf. with p. 291.

Central Provinces.

CENTRAL PROVINCES. 250

It is perhaps unnecessary to say more regarding these provinces than ...at the grapes of certain districts enjoy a high local reputation. They are ...er likely, however, to be grown for any other purpose than as a supply ...fresh and refreshing fruit. The large sale for the boxes of imported ...s from Kábul would seem to show, however, that the Indian grapes are ...o means, neither in quantity nor quality, able to satisfy the demands. ...following passage from a district report furnish some particulars re...ing the grapes of these provinces:—

...The vine is cultivated in the neighbourhood of Asírgurh to a small extent. It ...ery remunerative, though laborious description of culture. The opening of ...ulway has greatly extended the market, and the price obtained at the Chandni ...y station, where large quantities are disposed of, is now 5 annas a seer ...er lb). The grapes are of very excellent quality when thoroughly ripened; ...facility of carriage are generally plucked unripe. The area under this crop ...think, be expected to increase. The Asír vine, as well as the Kábul variety,

Indigenous Grapes. *Conf. with p. 270.*

flourish well in the Khandwa public garden" (*Settlement Report, Nimar District, p. 200*).

SIND & BALUCHISTAN. 251

Sind and Baluchistan.

It is well known that in many parts in these provinces, grapes of very superior qualities are grown, but the writer has failed to discover a detailed passage regarding either province worthy of citation. The late **Dr. Stocks**, in his report on Sind, says the name *Drákh* denotes the ordinary country grapes. Raisins (*kishmis*), he says, are not made in Sind, but two wines are prepared, *viz.*, *kishmishi* wine prepared from dry grapes, and *angúri* wine from fresh grapes; both these wines, he adds, are often strengthened by a spirit prepared from sugar. *Angúri*, he tells us, was in his day made at Hyderabad, Sehwan, and Shikarpore. The writer has not been able to discover whether these wines are still available. **Murray** (*Plants and Drugs of Sind*) says the crop is very precarious.

BOMBAY. 252

Bombay.

One of the earliest notices of the grapes of this province occurs in a review of the report of the Dapuri Botanic Gardens. On this subject **Royle** says: "The grape vine, **Dr. Gibson** mentions, as common in the eastern parts of the Deccan, where it afforded a cheap and delicious article of food, sold in some bazars, and yet that it was uncultivated in many places well suited to it. Into Khandesh it had been introduced by the Collector of Revenue, and was quite naturalized, though it had at one time been said that the air of this district was unfavourable to it." **Graham** (*Cat. Bomb. Pl.*, 33) remarks that "the common grape vine, successfully cultivated in the Deccan, about Poona, Ahmednuggur, Aurangabad, etc. **Dr. Gibson** mentions that it is very susceptible of blight from fogs and heavy atmosphere; this may account for its failing below the Ghâts, where the atmosphere is comparatively moist."

The following passage from the transactions of the Agri.-Horticultural Society of India (*Vol. I.*, 95) will, however, more fully convey an idea of the opinions that prevailed in Western India at the beginning of this century on the subject of vine culture:—

Mr. G. Ballard wrote in 1824:—"In Bombay we find the soil best adapted to the culture of the vine, to be a light sandy earth free from moisture. When the soil has in the first instance been of a stiff clayish nature, I have seen it much improved by trenching it to the depth of thirty inches, or three feet, and filling up with sandy earth, from the cocoanut woods, and the small white sea-shell, in the proportion of two-thirds of the former and one-third of the latter in alternate layers each.

"We prune towards the end of October, taking care as soon as the rains are quite over to bare the roots of the vine completely in order to check vegetation, and give them a kind of artificial winter. Say, that the roots are on an average opened about the 5th or 10th of October, they are allowed to remain exposed in the first instance for fifteen or sixteen days, when they ought to be pruned, leaving, according to the strength and age of the vine, two, three, or four shoots, with so much of the last year's wood as shall exhibit three or four healthy eyes, it being from these that the bearing wood of the season is produced. As soon as these eyes begin to bud, which they generally do in about a week (I think) after pruning, the earth should be filled up around the roots, with a considerable quantity of manure, and the vines be regularly watered morning and evening until the fruit attains nearly its full growth, and begins to swell and ripen, when it seems to be necessary to decrease the quantity of water allowing the vines only such a portion as will keep them healthy, perhaps I should say watering every third or fourth day.

"Vines pruned at the season I have mentioned, generally yield fruit fit for the table about the end of January, and as we cannot expect them from the same vine to continue in perfection above a month or five weeks, we have latterly, and with great success, allowed a portion of them to remain, unattended to, till the month of November, and some few till December, when the same process takes place in the treatment, that I have endeavoured to describe above.

VITIS vinifera.

VITICULTURE in BOMBAY.

"By these means we obtain a regular succession to the end of April, and sometimes till the middle of May. About a fortnight after the vines, which produce in January, have done bearing, say, the middle of March, the roots are again bared, as in October, and the system of pruning, manuring, and watering, once more resorted to, but as two crops in the year would weaken the plants, and that the second one could not attain perfection before the monsoon, we pick off all the promised fruit before it comes to any size, for once touched with heavy rain it loses all its flavour, and ceases to be of any worth.

"The vines which have been pruned in November, of course produce about the end of February, and are similarly treated with the above, at the proper season. Of the later ones, which, producing in March and April, would need pruning just at the commencement of the rains, I cannot with any confidence, though I think ——, who has been one of our most successful gardeners, told me he had not pruned these more than once a year. It is only by experience that we gain any knowledge of the treatment of European plants in this country, and it may perhaps require another year or two ere we can satisfy ourselves, as to the comparative strength and healthiness of vines managed in the latter mode.

"The change of seasons is so similar in Bengal and Bombay that I shall think the same kind of treatment adapted to both places, and it is more on this score than any other that I hope this memorandum may be useful, for, of the scientific part of gardening, I profess my utter ignorance. A great deal of most valuable information regarding the culture of the vine and other fruit trees is to be found in a work published by **Forsyth**, many years head gardner to the King, and which I have several times seen for sale in this place; I think it is entitled, "Forsyth on Fruit Trees.""

In order to convey some idea of the position vine-growing occupies in Bombay at the present date, the following two passages from the Gazetteer may be furnished:—

Ahmadnagar. 253

AHMADNAGAR.—"Vines, *draksh*, are grown in the best garden lands near Ahmadnagar and to a limited extent in Parner, Shevgaon, Shrigonda and Jamkhed. The vine is grown from cuttings. In August or September the vine grower gets cuttings, each with three or four eyes, and puts them into a bed near the well, each cutting being buried till the lower eye is level with the ground and the top of the cutting is sealed with clay and cowdung to keep in the sap. These cuttings are watered daily, and in about ten days begin to shoot. The ground in which the vines are to be planted is ploughed several times till it is free from clods and weeds. At intervals of nine to twelve feet pits are dug a foot and a half square and as deep, and filled half with good soil and manure mixed in equal quantities. The sprouting cuttings are planted in pans in these pits, firmly set into their place with plain earth, and watered every six days. As the shoots grow four small stakes are placed round each cutting, and the other shoots are trained from one to the other, tying them in their places but keeping each vine separate. In five months they grow to the height of a man, when thick stakes of the coral tree *pángára* (**Erythrina indica**) are planted near them as permanent supports and the topshoots of the vine are nipped off and they are trained on the coral trees. The coral tree is often a growing stump about five feet high and pollarded. For twelve months other garden produce, the egg plant, onion, and pumpkin are raised in the vineyard, care being taken to water the vines once a week unless the rainfall is heavy. In the following October all the branches are pruned to three eyes from the stem, the prunings being available as cuttings, and the flower soon appears. After the fruit has begun to form, water is not allowed to remain in the bunches, and every morning, for the first two months, the husbandman walks round and gently shakes each vine, holding a basket lid underneath, into which dead or diseased leaves, fruit, and insects fall and are carried away and burnt. A vineyard is calculated to yield a quarter crop at the end of the first year, a half crop at the end of the second year, and a full crop at the end of the third year, and, with a moderate amount of care, lasts for about fifty years giving a full crop each year. The vine is also trained in a small open trellis, which is set over the vineyard about six feet from the ground. The pollarded plant is said to give the best yield, but the rich prefer the trellis training, both for its look and its shade; it is also said to keep the vine in strength to a greater age. The vines yield a crop of sweet grapes in January, February, and March, and a crop of sour grapes in August. The sour crop is large, but the husbandmen do not encourage it, as it is of little value; the sweet crop receives the greatest care, but is not easily brought to perfection. After each crop the vines are pruned, and after the sour crop they are manured with salt, sheep's dung, and salt fish which is particularly valued, as it is supposed to keep off white-ants. Once every five or six days the earth is loosened round the roots and the vines are

Grafting not practised.

Two Crops.

VITIS vinifera.

Progress and Development of

VITICULTURE in BOMBAY.

Blight. *Conf. with p. 292.*

flooded. When the buds appear the vine is often attacked by a blight. To remove the blight the branches are shaken over a cloth into which the blight falls. It is then carried to a distance and destroyed. The diseased branches have to be shaken three times a day till the buds are an inch long. To grow vines requires an outlay much beyond the means of most market-gardeners. There is no profit for the first two or three years. Men from Bombay, Ahmadnagar, and Sirur buy the growing crop, the gardener agreeing to continue to water them and the buyers paying for the watchmen who are kept day and night; and in some cases for hoeing and manuring. The buyers, who pay only half the sum agreed, count the bunches and estimate their value at about 2*d.* the pound (6 *shers* the rupee). A vineyard, estimated to contain about thirty-five bullock loads of 120 pounds each, yields a crop worth about £35 (R350). No attempt is made to separate the ripe fruit from the unripe, the diseased from the sound. The bunches are wrapped more or less securely in grass, put into large baskets, and carried on bullocks to the nearest railway station, which sometimes takes two days to reach. From the Railway station the owner consigns them to a broker at the Bombay Crawford Market who puts them to auction, and, deducting his fee, remits the proceeds to the purchaser who pays the husbandman the remainder of the sum agreed. The grapes are sold at the Crawford Market at about 4 *d.* the pound (8½ shers the rupee)" (*Gaz. Bomb., XVII., 275*).

Nasik. 254 Indigenous Vines. *Conf. with p. 270.*

NASIK.—" Vines, *dráksh*, of three kinds, *abai*, *phakdi* or *phakiri*, and *káli*, have for long been grown by Kunbis and Malis in Nasik and Chandor. The vineyards are in rich garden lands carefully fenced. Cuttings are laid in September and get out in April and May. The land is ploughed and made ready as for sugarcane. Parallel lines eight feet apart are drawn along and across. At the crossings, which are marked with small sticks, holes, a foot and a half deep and a foot broad, are dug, and filled with half a basket of well seasoned manure. The cuttings are then planted in the holes and watered every fourth day, until they sprout strongly. Then they are regularly watered every ten or twelve days, and given poudrette and other rich manure. The shoots are at first trained on dry sticks, and after about four months, on forked *pángárá*, (**Erythrina indica**) stakes three or four feet high and three to four inches thick. These take root readily and are often trimmed so as not to grow too freely. In the rains most of them are allowed to grow, so that the upper shoots may supply the place of any stakes that die. When it reaches the fork, the top of the vine is lopped to force the stem to throw out side shoots. These side shoots resting on the *pángárá* branches keep the heavy weight of the top shoots and the fruit from dragging the plant to the ground. Vines bear fruit from the second year, and if properly cared for, go on yielding for more than a century. They are trimmed twice a year in Chaitra (March-April) and Ashvin (September-October), and they bear fruit about four or five months after each trimming. The first are sour and are sometimes used for pickles and jams, but are generally allowed to decay on the tree. In Phalgun (February-March) four or five months after the second trimming, the vines yield good sweet grapes and the loppings then made are made for new vineyards. Vines were formerly largely grown in Nasik and at Satpur about four miles off, but about seven years ago they were attacked by a disease and most of the vineyard had to be destroyed. They also suffered considerably during the recent years—a scanty rainfall (1876-77), but their cultivation is still carried on" (*Gaz. Bomb., XVI., 102*).

Two Crops. Disease.

Bengal.

Bengal. 255

As vine culture in this Province from the high annual rainfall is never likely to be of much importance, it may suffice to furnish a few passages in illustration of the degree of success that has hitherto been obtained. In the upper divisions of the Province as, for example, in Behar, where the climate approximates to that of the North-West Provinces, greater success has been attained than in Bengal proper, and fairly good grapes are accordingly often produced as, for example, at Dinapore and in Tirhut.

Behar. 256

DINAPORE—BEHAR.—**Captain Sage**, Secretary to the Behar Branch of the Agri.-Horticultural Society, in a letter dated 9th August 1832 (*Trans. Agri.-Horti. Soc. Ind., II., 202*), wrote "In July, 1829, I took possession of a small estate at this place, the garden of which contained a vinery in its infancy running north and south, the sides consequently exposed to the east and west; it is 110 feet long, 15 feet broad, and 7 feet high, having on either side eight vines. I am not sure that in 1829 a few bunches of grapes had not been produced, the number, however, was probably small,

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VITICULTURE in BENGAL.

Indigenous Grapes. *Conf. with p.* 270

as, at this time, the vines were only two years old. In November of this year, I took down the whole of the vines, pruned them, stripped off such leaves as remained, and spread the branches, as far as they would extend, over the top, and carrying others horizontally along the sides. The roots were then laid bare, washed, and all filth and scab removed from them. In this manner they were exposed to the cold in the hope of creating an artificial winter, throwing down the sap, and destroying for the time all vegetation, thus giving the vines rest, to enable them in the spring to put forth all their vigour. They remained thus exposed all December and part of January, when they were treated with a composition of fish, *goor*, and black earth (from the native distilleries or toddy shops), mixed together and laid round the roots: the earth was then filled in, and the vines left to themselves. From absence, I am unable to state when the first buds burst, but on my return in the middle of February, 1830, vegetation was strong and appearances were very favourable. On my return from Sarun the end of March, I found the vines covered from the very ground with bunches, it was a display (ridiculous from excess) such as no one had seen at the station, or in the neighbourhood. I proceeded to thin the vines (not the bunches) and filled three large baskets. The *malli* said, he had irrigated them as soon as the young fruit was formed, and every third day, they were well flooded. I saw the vines again the end of May, when the fruit was ripe to some extent, the appearance of the vinery was most splendid, according to the *malli's* computation there were upwards of 3,000 bunches of fruit on it. The roof looked, from the entrance as if formed of one canopy of grapes. These vines are all of the white or common kind, and I had intended to give the Society an account of the success attending this mode of treatment, but was prevented by the late Dr. Charles Hunter, who was amazed at the quantity of fruit and declared, I had so forced the vines, that it was impossible they should bear the following year. I then determined to give a trial of three years, which including changes of weather, might give an average of success on which the Society could safely rely. In November, 1831, as last year, these vines were treated in the same way; the roots bared, washed, and exposed, manured with blood from the slaughter-houses, and such dead animals as I could procure, chiefly dogs and sheep, and they were exposed to the cold in the same manner, and for the same length of time. The season was unfavourable for fruit, and a blight attacked the young grapes, and nearly half were destroyed. But in proportion to the success of these in the neighbourhood, I had a large crop, upwards of 1,700 bunches ripened, and were in size and flavour exceedingly fine. This year I added to the length of the vinery, and planted eight Constantia vines, four on each side. They were from Sarun, about 12 months old, from slips. In November, I again had the whole taken down, pruned, and spread out; the roots bared as deep as it was safe to go, washed, and a great quantity of fish given as manure, and the earth was filled in to obviate the horrible stench that was thrown out by the fish, nor could I have the roots bared again, although our winter was exceedingly cold and wet; indeed so great was the cold, that February passed without any show of vegetation, and it was near the 8th or 9th of April before they budded. About the 15th of April they were literally covered with blossoms, but at this time we had a heavy hailstorm, the stones of great size; I measured one 4 inches and 4·10 in circumference. The young grapes were just set, and the top and west side of the vinery from which the storm came, suffered very much; the bunches and young shoots were broken off, and the vines, I am afraid, considerably injured, as what would have been the bearing shoots of next year, are mostly broken off; they may still, however, as the plants are very healthy, be prolonged, so as to be available hereafter. In consequence of this storm, the eastern side has nearly all the fruit remaining, and it amounts to 865 bunches. Of the eight young Costantia vines only two have borne, and one has eighteen bunches on the principal stem, and the other seven, though they were only 3½ feet in height.

Crops of 3,000 Bunches.

Blight. *Conf with pp.* 291-3

Hail storms. Destructive.

From the average 1,521 of these three crops, compared with the produce of other vineries in the immediate neighbourhood, I think it is satisfactorily proved, that allowing something for the vines being young, and the ground, comparatively speaking, new, opening the roots, washing them, and exposing them as much as possible to the cold so that the sap may be successfully thrown down and vegetation stopped, is the first thing to be done. The next, a preparation of good rich manure to be laid over the roots and covered as the spring is about to commence. The branches must also be equally spread over the jaffry, so that light and heat may have access to the whole. It is also rather an advantage that in constructing a vinery, it should be partially protected from the violence of the easterly gales, for these gales bring the blight which consists of a great number of small brown iron coloured spots all over the grapes and leaves; the latter wither immediately. The grapes never increase in

Blight. Brown spots over leaves and fruit. *Conf. with p.* 293.

VITIS vinifera.

Progress and development of the

VITICULTURE in Bengal.

size after the blight covers them; and while the bunches that have escaped its baneful influence, swell into large luscious fruit, the blighted ones retain the appearance of discoloured peas. We are in great want of good vines at Dinapore, and if I could procure some good ones from the Cape, I think of trying the hot house plan, which would bring them into use in March, April, and May, instead of having them destroyed by the rains, which the greater part of the grapes are annually."

By way of showing the success that has been attained in the vicinity of Calcutta through assiduous attention to every detail, the following account addressed by Capt. Milner to Dr. Wallich in 1837 may be furnished (*Trans. Agri.-Hort. Soc. Ind. VI., 54*):—

"You were right in supposing the pale green grape to be the Muscatel. The purple cannot, I imagine, be the 'blue Hambro' as it is a cluster grape, and only attains its present perfection by being constantly thinned with a fine pair of scissors when the fruit has formed. These vines, together with another fine sort, like the Portugal grape, the fruit of which, I am sorry to say, is not sufficiently advanced to enable me to send a specimen, were brought from the Cape about seven years ago, and were planted in a sheltered alley between two high godowns, where they have flourished surprisingly well. The purple vine is the more hardy, and produces much more abundantly than the Muscatel. Our largest purple vine could scarcely have had less than a hundred branches of grapes upon it this year. About the beginning of January the vine are removed from their trellices and extended on the earth, all the remaining leaves stripped off, and the branches *effectually* preserved; the roots laid open, superfluous fibres cut away, and a portion of the bark of the main stem of the vine removed, scraped off with a knife,—the whole length of the stem. After being suffered to remain a month in this state the roots are covered with fine fresh earth mixed with a little *surkee* and vegetable manure. We increase the richness of the soil by *burying fish* (*covered with oil-cake* to prevent vermin), at about half a yard distant from the root of each vine. Four pounds of fish for each vine will be sufficient.

"I must not omit to tell you that vines had been planted in various situations in this garden, and every possible means adopted to ensure their growth, but entirely without success until it occurred to Mrs. Milner to try the plan adopted at Pondicherry; and much to our amusement the alley before mentioned was cleared and the result you have now before you. Was it not a happy discovery?

"I am sure you will be delighted to see the specimens of grapes. They are so beautiful; and the plain and clear statement of Mrs. Milner's mode of treating her vines will likewise, I am sure, be interesting to you and the Society."

Assam.

ASSAM. 257

Very little has been said within recent years on the subject of vine culture in this Province, though it would seem that in the less rainy portions of the province fairly good grapes can be and are produced. The following passages will show the efforts that were made during the early decades of this century to establish an industry in vine growing:—

"*Successful cultivation of the Grape-vine in Lower Assam—beneficial effects of under-draining.*

"A long and interesting letter from Major Jenkins was next brought to the notice of the meeting. Major Jenkins states, he has succeeded in maturing very fine grapes at Gowhatti, and as the soil and climate are, he thinks, little propitious to vines, or any fruits of the colder countries, his success may be attributable to the management of the plants, and he therefore conceives that a note of his treatment of them may be useful to others. Major Jenkins adds, that he has lately reduced a piece of morass of the worst description to good garden ground, by under-draining, and, as he thinks, his mode of managing it may be deemed sufficiently useful to be placed on record, he has the pleasure of giving it to the Society.

"The best thanks of the Society were given to Major Jenkins for his useful communication, which was transferred to the Committee of Papers for the Journal" (*Jour. Agri.-Hort. Soc. Ind., III., 185*).

Major Jenkins fully dealt with his experiments in a paper designated *Hints for the management of the Grape-vine in an unpropitious*

VITIS vinifera.

soil and climate, with an account of the beneficial effects resulting from a system of under-draining — (G Watt)

VITICULTURE in Assam.

"I have to thank you for a late note (whose date I cannot quote, for I have unfortunately mislaid it), forwarding opinions on the value of our hemp from the Urtica nivea

"I take this opportunity of mentioning that I have succeeded in maturing very fair grapes at this place, and as the soil and climate are both little propitious to vines, or any other fruit of the colder countries, my success may be attributable to the management of the plants, and a note of my treatment of them may, therefore, not be amiss. I may first premise, that the soil of Gowhatti, at least of my garden and the greater part of the station, is a deep diluvial red clay, which in the dry season is as hard and dry as a brick bat, and in the rains, absorbs and holds water like a sponge In the highest part of my garden, a spot relatively high with reference to all the adjacent ground, I sunk a well thirty or forty feet, with the hopes of meeting a spring for use in the cold weather, but I failed, and in the rains the waters rise and flow over the top of the well, swamping all my garden The climate is as bad as the soil. After a dry season of three months, in November, December, and January, when the cold and drought is sufficient to stop vegetation almost entirely, a short vernal season in the beginning of February is followed by constant heavy rains and storms, with alternate bright and burning summer days, so that the fruit of this season that is slow in ripening is very liable to be rotted before it comes to maturity

"The first vines I tried were planted round an open summer-house, built purposely to shelter them; the plants were set in a walk of rubbish round the house and under the leaves of it, from whence the branches were carried over a trelliced verandah. The plants bore abundantly, but very little of the fruit was sufficiently ripened to be at all eatable. It then occurred to me to plant vines round flat-roofed pucka buildings, with the view of maturing the fruit by the heat of the walls. I set the trees, as before, in broad walks of pucka bricks, stones, and bones, and trained up the vines against all the sides of the building by nailing them lists to the wall, and in this manner I have obtained this year, from trees three or four years old, a large quantity of fruit mostly well ripened The plants are the common white sweet water of Hindustan. I have never seen branches of grapes more dense, and I should have had far better fruit had I taken the trouble to cut out with a scissors one-half the fruit.

"The building to which I have nailed the vines, have plain, upright walls, with little or no cornice and from the want of some protection on the southern walls, I have found that, after heavy rain, the bunches of fruit are liable to be burnt up by the fierce suns which we have at intervals, but this, I think, might be prevented, either by training the vines at a short distance from the southern walls on poles, or by bringing the upper branches out over a trellis, so as to shade the wall in some measure. The best fruit I got from a northern wall in the middle of July.

"My management of the vines otherwise has been left to my mallee and been careless enough; and the manure he has used has been a little rotten fish and sheep's blood.

"I should also mention that the branches of one of my vines strayed into a Guava tree, and with the shelter thus afforded, produced some well-ripened fruit.

"The foregoing hints may be of some service to those who have as yet a climate as this of Assam to deal with, and I have only further to note, that from my experience, I believe, it is essential in Bengal and the Eastern Frontier, that vines should be planted on an artificial substratum of rubbish of pucca buildings, or of stone, brick, and bones, and if in the vicinity of *pucka* buildings, the plants will fruit the better."

Madras.

MADRAS. 258

On the plains of Madras it may fairly well be said the vine is never likely to rise above the position of being a triumph of laborious gardening. On the mountains and tableland it is quite otherwise. The public have been made familiar with the successful results that have been attained on the Nilghiri hills, in Mysore and Coorg, (*Conf. with Kew Bulletin, 1889, p. 23*) in the Wynand, and other such localities through the appearance, in the local newspapers, of glowing accounts and high expectations. Sir Walter Elliot (*Flora Andhrica*) shows that in his time the subject of vine-

VITIS vinifera.

Progress and development of the

VITICULTURE in Madras.

growing must have been energetically prosecuted, as he furnishes numerous notes on the plant and its local and classic synonyms. So far it may be said that the grapes of the higher and drier tracts of South India resemble those of the Deccan generally, and possess very little of a purely local character. In the report of the Botanic Gardens of Bangalore for 1890-91 a highly encouraging statement is made of the vineyards under the charge of the Superintendent. The palace vineyard consists of 14 fruiting vines, covering an area of 600 square yards. The English vines introduced in 1888 are making fair progress. Large number of vines have been distributed to intending growers. A plant called the "Spanish Vine" has recently been added to the collection. Some new varieties of the Aurungabad vine have also been promised by the Director of the Department of Land Records and Agriculture, Bombay. The following account of vine-culture in Bellary appeared in 1842, and may, therefore, be read with interest as manifesting the leading characteristics of the system of cultivation then pursued :—

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Indigenous Grapes. *Conf. with p. 270.*

"Vines are sometimes propagated in this country by layers, but the more general method is by cuttings. These are procured at the time of pruning, which is usually in the months of October or November. The cuttings should be about 14 or 16 inches in length, and placed in a slanting position, about three-fourths of their length in the ground, so as to leave only three or four buds above the surface. They should be planted about 18 inches apart, so as to leave room for transplanting them, without injuring the roots. The soil in which the cuttings are planted should be light, and well manured, and they should be moderately watered every two or three days; when they have taken root they will probably throw out three or four shoots, the strongest and most healthy of which, as soon as it can be ascertained, should be selected for the stem of the future vine, and all the others carefully taken off. This should be trained and supported with much care by a bamboo or stick, and the lateral shoots taken off as they make their appearance, till it has attained the height of the *pandall* against which it is to be planted. In 10 or 12 months they will be ready for transplanting, or if necessary, might be removed earlier without injury.

"The *pandalls* used in this country are generally about 6 feet high, but I think one much lower is preferable. At Bellary I have one 6 feet in height, and three of 4 feet, and I have invariably found the latter to answer best; on this neither the blossom nor the fruit are so much exposed to injury from blights or strong winds, and I have generally found the fruit more abundant, much finer, and to ripen better on the low than on the high *pandalls*.

"At Bellary we commence pruning as soon as the rains cease, in October or November; and as we have several *pandalls*, leave an interval of about a fortnight between the pruning of each; by this means we obtain a constant succession of fruit from about the middle of March to the end of June.

"In pruning much care and judgment should be exercised, all dead and useless wood should be carefully taken away. In general, all the last year's shoots (except where the vines are very young and the *pandall* bare) should be cut away within a few inches of their commencement, leaving from two to four or five buds only. On those branches which are strong and healthy, four or five buds, or eyes, may be left, but if small and weak, not more than two or three; almost all the native gardeners err in pruning vines much too sparingly. By leaving too much wood the vine is weakened, and the fruit degenerates. There may be a few more clusters, but they will be small and inferior.

"I should have mentioned that previous to pruning vines, their roots should be opened and laid bare about 18 inches round the stem, and if they are five or six years old or more, may remain open 12 or 14 days: this will lessen the sap and cause the leaves to fall off. If they are very young, six or eight days may be sufficient.

"When the roots of the vines have been bared a sufficient time, then prune them, and at the same time, trim the roots also, by removing with the knife all the little fibres which surround the larger roots and have been thrown out during the last year, leaving only the larger roots. After pruning, let the branches be properly disposed in the *pandall*, and tied in their places, that they may not be afterwards displaced and broken by the winds.

"It is customary with many persons to use a very rich and expensive [illegible]

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[1] Jour. Agri.-Horti. Soc. Ind., I., 294).

of vine-
on this
reviews
artment
, by Mr
. Breeks
leading

Burma and Manipur.

BURMA. 260

MANIPUR. 261

with oranges

MANUFAC-

these branches of the trade of viticulture can be said to be at present 202

VITIS vinifera.

Manufactures of

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largely practised in India. Leaving, therefore, wine manufacture entirely out of consideration, a few brief passages may be furnished on the subject of raisins and currants. Dr. Aitchison says that "In Herat and its vicinity the largest amount of raisins are preserved, and much of the vine and spirits prepared. Throughout the country generally a syrup or very thin treacle is made from the juice of the grape." Dr. Cleghorn's account of the manufacture of raisins in Kanáwar has already been quoted (see p. 234), and it does not appear that the system pursued anywhere in India differs materially from that in Afghánistán. Before, however, giving the recent information which has been collected officially, it may be of interest to furnish a passage regarding an experimental manufacture of raisins in the Nizam's Dominions, Hyderabad, reported in 1840:—

RAISINS. 263 Hyderabad. Varieties of Grapes. *Conf. with p.*

Four boxes containing specimens of various sorts of Raisins prepared under his inspection from Grapes, the produce of the country. Presented by Dr. x. Riddell.

"The Raisins here presented were prepared from three varieties of grape:—

The *Saiboe*, a white grape, which sells generally at two seers for the rupee, and is consequently too expensive to be converted into raisins, except as an experiment.

The *Fukerie*, a very luscious water-grape, sells from twelve to twenty seers the rupee.

The *Bokirie* is still more plentiful and is extensively cultivated, as from its cheapness the grape is consumed by the poorer classes. Sixty seers is the quantity that may be obtained for a rupee.

The plan pursued by Dr. Riddell, in the preparation of these grapes, was simply to get them in as ripe a state as possible, and expose them occasionally to the sun on mats, turning them as necessary; they were dry in ten or twelve days. One box contains raisins prepared from the Bokirie grape after the method laid down in Grey's *Pharmacopœia*. Dr. Riddell does not think he has been so successful with this latter as with the grapes treated in a more simple manner, but wishes to obtain information on this point from the Society, being anxious, now that he has quitted that part of the country (Runnur), to induce the natives to whom he has taken the trouble of pointing out the mode of preparing the grape, to carry on the experiments, as it is probable if properly attended to, that this staple may become a much greater article of commerce than it is at present."

Afghanistan. 264

In April 1891 Mr. Dwyer of Mianwali, Bunnu, in the Panjáb, addressed the Government of India on the desirability of obtaining information on the subject of the methods pursued in Afghánistán in the manufacture of raisins. Mr. Dwyer asked some six questions. Mr. E. H. S. Clarke, Deputy Registrar of the Foreign Department, furnished the following reply, which will be seen to deal with the various questions raised by Mr. Dwyer:—

"I can personally answer nearly all Mr. Dwyer's questions. At different times I have seen a good bit of the grape-drying process in various parts of Afghanistan; and at one of the large villages of the southern slopes of the Hindu Kush in 1880 I made some enquiries about the process, my attention being attracted to the quantities hanging up to dry in the shade of the houses. I will endeavour to answer Mr. Dwyer *seriatim*.

1. How is the Kishmis grape dried in Afghanistan?

The Kishmis* grape is a small green grape (not black), very sweet when ripe, and seedless. It is dried in two ways—by exposure to the sun; by hanging up in the shade. Those dried in the sun become of a red-brown colour; those dried in the shade of a dead green. The sun-dried grapes are considerably cheaper than those dried in the shade; and naturally so; for the latter have to be hung up in the rooms or verandahs of the houses: and moreover, the bunches are picked while the Kishmis is still rather tart, or little more than half ripe and consequently smaller. A man may have a very large vineyard, and yet very little space for drying in the shade, *i.e.*, in the verandah or rooms of his house. The local name for these grapes when dried is *Kishmis-i-sayagi*. The sun-dried grape is *Kishmis-i-surkh*. When quite ripe the bunches are picked and spread on the roofs of the houses, or on a patch of hard-

* The bunches contain an immense number of grapes, the skin of which is very thin.

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ened ground near the house, in the full blaze of the sun. Sometimes a child is left to keep off the wasps, but more often than not, they are just left alone.

2 and 3. What are the processes the grape is put through before it is exported? Why is the *Kishmis* not dried in bunches instead of loose?

The *Kishmis* is partly dried in bunches. Were it otherwise, the juice of these small grapes would be lost, and the roof or ground whereon the grapes are dried would become a mud-heap. When the *Kishmis* is half-dried, it is stripped from the bunch, and the drying completed, either in the sun or shade as the case may be. I believe they are subjected to no other process whatever

4. To what degree of ripeness should the *Kishmis* be allowed to reach before removal from the *vine* for drying?

This I have answered above - *half ripe* or let us say while still rather tart for the green variety, and fully ripe for the *Kishmis-i-surkh*

5. *How many days does it take to dry the Kishmis?* I am sorry I do not remember. I should think, however, not more than 20 days for either kind, judging from the fact that I saw many lots ready for export plucked from the same vines which still bore ripe grapes. Much would depend on the heat of the sun and the state of the atmosphere.

6. *How should the Kishmis be packed for export—in bags or packing cases?*

I have never seen them packed in cases It is the invariable custom in Afghanistan to pack them in sacks, and it seems to answer well. It would certainly not be wise to attempt wooden cases in Afghanistan where the transport would be entirely camel."

The information desired by Mr. Dwyer being of considerable public interest, Sardar Muhammad Afzal Khan, British Agent at Kábul, was invited to furnish any information he might be able to procure, and the reply obtained by the Government of India amplifying in many essential features the knowledge already possessed in India, may be here published:—

Varieties of the Grape in Afghanistan. Conf. with p. 270.

"Four vine lands of the Kábul district—Istalif, Gozar-i-mama-Khatun, Katakan, and Nanchi—are among the more notable vineyards of Afghanistan. The fresh fruit of the vine is termed *Angur*, and the dried grape is generally known as *Kishmish*. The latter term is, however, specially applied to two of the varieties of the fresh fruit, probably because they were the only fruits that were generally dried for trade

There were seventeen known varieties of grapes in Kabul, *viz.*, white *Angúr-i-kismish*, black *Kishmish*, *Khalili*, *Ashkari*, *Husaini*, *Kandari*, *Josi*, *Goladani*, white *Sahibi*, red *Sahibi*, *Al-i-josh*, *Ayala*, *Kish-baba*, *Lal Monaka*, *Dida-i-gao*, and *Kalta*.

Raisins are of three kinds in Kábul and are dried in two ways, *viz.*, first by hanging the bunches of the fruit in the shade, and second by exposing them to the heat of the sun; the first is called *Kishmishi-i-sayagi* or the shade raisins, and the second is *Kishmish-i-aftabi* or the sun raisin. The fruits intended to be dried in the shade are severed from the vine in bunches or in clusters, and gathered generally in the beginning of September. They are then removed from the vineyards to the lofty roofed shades built of mud and straw, where they are hung upon bamboos or other long wooden poles, suspended by thick ropes. The time required for the drying of the fruits is generally three months, should the climate be dry; but in case of a wet or rainy climate, the time should be six months. At the end of the period of drying, the poles are shaken, and the dried fruit pour down with their tops. The shades are sometimes built so large and spacious as to contain 25 to 30 *Kharwars*—a *Kharwar* being equal to 16 maunds.

The grapes intended to be dried in the sun are also gathered in bunches at the end of September or the beginning of October and spread on the ground. The period of drying varies from 30 to 40 days according as the raisins are exported soon or late. Should they be exported early, they are exposed to the sun for 40 days, but if they are exported later they are dried for 30 days only. During this period the fruits are turned often up side and down. At the end of the period the grapes are severed from the bunches by the hand, the tops going always with the fruit

In no case is the fruit left on the vine to dry, because the time required for this would be very long and the setting in of the winter puts it in the danger of being otted by rain or snow. Besides, the fruit drops on the ground, and is eaten by birds and mice, and thus the cultivators lose produce

The stated time of gathering the fruits is the only degree of ripeness* the Af-

* This means that the grapes to be dried in the shade are gathered about the beginning of September (before they are quite ripe), and that those to be dried in the [illegible] are picked a month later, when ripe.—*E. H. S. Clarke.*

VITIS vinifera.

Method of preparation

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ghans are said to know of. The wholesale rate of the sun dried raisins is 18lb to 64lb a Kábul rupee according to the fluctuations of the market and the forecast of the crop in Kábul; while the shade raisins, or *Sayagi*, are sold at 10 to 32lb a Kábul rupee. The *Manakka* raisins, however, are dear; the wholesale rate never exceeds 24lb a Kábul rupee.

Every kind of raisin is packed for export by the Afghans in gunny bags, along with dried tops, to prevent the fruits sticking together. If the fruit be packed in wooden boxes, they would reach foreign countries in a better condition, but the expense would be proportionately increased and consequently there would be risk of the demand being lessened and the market grow dull."

Since the above information on the subject of the manufacture of raisins, etc., passed to the press, the editor has had the pleasure to obtain two other communications on these subjects, dated June 1892. As these amplify very materially what has already been said, though going over the same ground, they may be published in full. The first communication, it will be seen, is a memorandum from the Political Agent and Deputy Commissioner, Quetta and Pishin. The second is a translation (also furnished by Major Gaisford) of a Report by Kazi Jelal-ud-din, Extra Assistant Commissioner, Quetta.

Indigenous. Grapes. *Conf. with p. 270.*

Memorandum regarding the method adopted by the Afghans for the preparation of the Kishmish grape for export.

The following descriptions of grape are used for preparing *kishmish*:—

(1) HAITA, a long white grape, called *Abjosh* when dry. This grape is collected when ripe and three mixtures are prepared.

(*a*) The first is made of 4 seers of *Barak*, a kind of grass which grows in Kandahar (Ephedra pachyclada) to 1 maund of water. The mixture is boiled. The bunches are dipped in this whilst boiling hot.

(*b*) The second mixture is prepared of lime 1, water 8 parts. This is boiled and then allowed to cool. The bunches, after being taken out from the *Barak* mixture, are dipped in this.

(*c*) The third mixture is prepared of potash crude (*khár*) 1 and water 6 parts. This is boiled and then cooled. The bunch is dipped in this after the lime bath. The grapes are then laid out on mats in the sun to dry, and are ready for export in about fifteen days.

The *Abjosh* is much prized and sells at Quetta from R12 to R15 per maund.

(2) The same grape, HAITA, is plucked when fully ripe and dried in the sun. This takes about thirty days. When dry it is called *Mánaka*, and sells for R5 per maund.

(3) The next in popular esteem to the *Abjosh* grape is the SAHIBI, a greenish-red grape, which when dry is known as the *Sahibi Kishmish*. It is picked when perfectly ripe, and the bunches laid out on mats in the sun. It dries in about fifteen days and is then ready for export. It sells at 3 seers per rupee.

(4) KHAYA GHULAMAN is another sort of grape. It is a long black grape, and when dry is known by the same name. This is taken off the plant when perfectly ripe, and dried in the sun on mats and is ready for export in fifteen days. It is sold at 3 seers per rupee.

(5) The "TAR ANGÚR, or black grape, is another sort that is dried, and when dry it is called in Pushtu *Tor Uchki*; in Persian *Kishmish-i-siab*, and known commercially as the *Drák*. This is dried and prepared in the same manner as the *Khaya Ghulaman*. It is sold at 4 and 5 seers per rupee.

(6) Another grape, which is white but nevertheless known as the *Lal Angúr*, is also dried and in this state goes by the name of *Lal Uchki*. This is the best sort of the *Kishmish*. It sells at the rate of 2 seers per rupee.

(7) The most extensively grown grape is the *Kishmisee* and which when dry is known commercially as *Kishmish*. It is a small round seedless grape. The bunches when perfectly ripe are hung up to dry in well-ventilated rooms—not in the sun—and are ready for export in a month. To be properly cured they must, however, be picked before the autumn and before it begins to get at all cold. When perfectly dry, the grapes are picked off the bunches and any that are bad are thrown away. This *Kishmish* is sold at 4 seers per rupee.

(8) Two other sorts of grape dried in the same way are the *Shundokhani*, an oval grape and the round red grape, the latter is known when dried as the *Lal Kish-*

MANUFACTURE.

mish. The *Shundokhani* is sold at 3 seers and the *Lal Kishmish* at 5½ seers per rupee. Both these are seedless.

2. All the descriptions of grapes are dried in bunches, but when packed for exportation are freed from the stems, as these make holes in the fruit and spoil it.

3. The grapes should always be thoroughly ripe before they are gathered for

G. GAISFORD, *Major*,
Deputy Commissioner, Quetta and Pishin.

Translation of a Report made by Kazi Jelal-ud-din regarding the method of preparation of Kishmish.

remain attached to the *Kishmish*, but as they are very thin and small they are a matter of no consequence.

(2) No other process is required for preparing the *Kishmish* than that described above.

(3) It will appear from the answer to question No. 1 that the grapes are dried in bunches.*

(4) The test of the necessary ripeness of the grapes is that their colour becomes yellow and they give no sour taste in eating. (This degree of ripeness is attained in Kandahar about the end of August.) It is necessary that the grapes be plucked from the vine and hung in the *Kishmish-khana* before the summer has entirely passed away, otherwise the *Kishmish* will not dry properly.

nistan, *viz.*, white (or green) and
hmish are made are of these two
ily *Artawi*) because it is dried in

* I understand the grapes are shaken off the stalks for convenience in packing and to reduce the weight.

H. S. B.

† *i.e.*, of the small Bedana, or stoneless grape, which is alone called *Kishmish* locally.

H. S. B.

‡ Of the two kinds of *Kishmish*, or Bedana grape, it is only the green or *Shana Kishmish* which is usually dried in the way described in paragraph 1. It is much more extensively grown than the red *Kishmish*.

H. S. B.

VITIS vinifera.

Varieties of Kishmish.

MANUFACTURE.

The people of Afghanistan put it in *palao* as a condiment. Its export is inconsiderable.

The *Haita* grape when dried in the sun is called *Manakka*, but if boiled in water it is called *Abjosh*. (The process of its preparation will be explained hereafter.) All sorts of grapes other than those mentioned above when dried are called *Woshki.**

Foreigners call all sorts of dry grapes *Kishmish*, and as the enquiry made appears to be about *Kishmish* in this wider sense, I will enumerate the different kinds. They are as follow:—

Lal, Sahibi, Shundu Khani,† *Abjoshi, Shana Kishmish, Sara Kishmish, Manakka Torey Woshki* and *Sund Woshki.*

The first three sorts are dried in the *Kishmish-khana*. They are only enough for presents to notable men and are seldom available for sale. *Abjoshi* is well fitted for trade and is exported to India in large quantities. *Shana Kishmish* is also suitable for trade and much exported.

Its method of preparation is described in the answer to the first question.

The process of preparing the *Sara Kishmish* has been dealt with in the answer No. 6 and the method of preparing the *Manakka* raisin is the same (*i.e.*, the *Haita* grape is dried in the sun). The *Tori Woshki* is made of black grapes which are dried in the sun. This species of grape is suitable for trade and can be exported to distant countries.

Tundi Woshki is made of *Tund* grapes, *i.e.*, of big green grapes. The *Tund* grape is the most inferior and least valuable kind of grape in Kandahar. It is white and round and rather sour and ripens later than other sorts of grapes. *Dushab*, or grape juice, is also made of *Tund* grapes. *Dushab* means that the juice of the grapes is boiled, and when it becomes thick it is taken off fire and eaten with *ghee*, etc.

As I have mentioned before, the *Lal Sahibi* and *Shund Khani* grapes are seldom abundant enough for sale. In Kandahar the price of raisins made of these grapes is R12 an English maund, that of *abjosh*‡ is R7 per maund, that of *Shana Kishmish* R6 per maund, that of *Manakka, Sara Kishmish* and *Tori Woshki* R5 per maund, that of *Tund Woshki* R4 per maund. The method of preparing *Abjosh* is as follows:—

When the *Haita* grape is well ripened and its colour becomes yellow, it is picked in bunches from the vine. The bunches, about 6 seers in weight, are tied to a tender branch of the pomegranate which bends but does not break. All the bunches are thus tied. After this a large cauldron full of water is put on the fire. When the water begins to boil about 6 seers of Fuller's earth (Persian *Iskhár*) is put in it. After some minutes about 2 seers of dry lime is also added. Then the cauldron is taken off the fire and the water is allowed to remain unshaken, so that the sediment may settle down. When this is done the clear water is poured off and the sediment is thrown away. This clear water is called *Tesab*.

Another large cauldron of pure water is then put on the fire and when it begins to

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* *Woshki* in Pushtu simply means dry grapes and corresponds to our word "raisin." The *Kishmish* proper is the small red and white Bedana grape, but as the Kazi says foreigners use the word in the sense of raisin to mean any dried grape.
H. S. B.

† *Lal, Sahibi, and Shundu Khani* are the names of the three better kinds of grapes in Kandahar. The raisins are called by the same names, but are only produced in small quantities for local consumption. There are also two other kinds called *Sheikh Ali* and *Khair Ghulamán*.

Abjoshi and *Manakka* are the dried *Haita* and *Hussaini* grapes.

The *Haita* and *Hussaini* grapes are the large green grapes exported so largely to India in small wooden boxes. *Shana Kishmish* is the white bedana (stoneless) grape and is prepared as in paragraph 1.

Sara Kishmish is the red bedana of less value and usually dried in the sun.

Tori Woshki are raisins of any other sort of black grape. "Tor" in Pushtu means "black."
H. S. B.

‡ The present rates in Kandahar for *Abjosh* is R9 per maund, for *Tori Woshki* R3-8, and for *Tund Woshki* R2-8.
H. S. B.

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or boxes are required.

COMMERCE. 265

Commerce in Grapes, Raisins, etc.—The grapes grown on the tableland of India are eaten fresh as a fruit, and are by the railways yearly being more thoroughly distributed from the centres of production of superior qua-

greenish yellow colour, and quite seedless. They are known as *Angúl*

2 to 4 annas a pound; Kábul grapes 4 annas a box containing about 100; raisins (Kábul and Persian) R5 to 7 per ℔; bloom, R5; *Munákha* R3; and *Angul Drakh* R6½ per Surat maund of 37½℔.

DISEASES. 266

DISEASES TO WHICH THE VINE IS LIABLE.

Phylloxera in Kashmir. Conf. with pp. 268, 274, 275.

is the only evidence of the existence in India of that most destructive of all pests, that the writer can discover, in the fairly extensive correspondence and series of reports that he has had the opportunity of consulting, while preparing the present review of the literature of Indian viticulture. It may,

fore (although in themselves these are sufficiently alarming), they are not beyond the means of remedial agencies, short of extermination and substi-

DISEASES.

tution of new stock, seems unmistakably the case. The following passage will shew, for example, that many years ago the Natives of India had come to appreciate the value of sulphur in the treatment of one of these diseases.

In the Transactions of the Agri.-Horticultural Society of India (*Vol. I., 104*) Mr. W. Leycester furnished Dr. Wallich in (1824) with a translation of a book on gardening, written apparently by a Native of India. Neither the name of the book nor its date of publication has been furnished, but a remark occurs regarding the diseases of the vine (*dakh*) which would seem to prove that the disease then most serious was of fungoid nature. "To remove the diseases of the vines, says this author, you make a smoke under them with raisins, mustard seed, and sulphur." At the present day sulphur is considered the most effectual cure that is known for Oidium, but it is chiefly sprinkled in dry powder over the affected parts. It will be recollected that Dr. Cleghorn identified the disease seen by him in 1863 on the Kanáwar vines as the fungus known as Oidium. A specimen seen by the writer of a diseased leaf from Bashahr appeared to be a Peronospora. It may thus, perhaps, be admitted that the first and most rational course, by which aid could be rendered to viticulture in India, would be the institution of a thorough scientific investigation of the vine diseases at present existing in the vineyards of this country. It would be beyond the scope of this article to furnish a detailed account of all the vine diseases, indeed, of even the more common; but it may, perhaps, assist those interested in the subject to have the chief facts exhibited of the three great vine diseases, *viz.*, Phylloxera, Peronospora, and Oidium. It is quite possible, however, that Indian vines possess certain special and peculiar diseases of their own unknown to European students of this subject.

The Vine Louse. 267 *Conf. with p. 268.*

1. **Phylloxera vastatrix**, *Planch.*

THE VINE LOUSE.

Syn.—PEMPHIGUS VITIFOLIÆ, PHYLLOXERA VITIFOLIÆ, *Fitch.*

References.—*Vines and Vine-culture by Barron, 156; Several volumes of Reports presented to the Institute de France (Acad. des Sciences); Observ. sur Le Phylloxera et sur Les Parasitaires de la Vigne, 1881; Nicholson, Dictionary of Gardening; Kew Bulletin, 1889, 66, 230, 236, 255; 1890, 36; 1891, 44; Riley, State Entomologist, U. States—numerous Reports, etc., etc.*

Habitat.—This insect first became known in 1854 as a destructive pest on the vines of America, when it was described by Fitch. On its appearance in Europe in 1863 to 1866 it was referred to its correct genus. In 1866 it assumed vast proportions in Tarascon, in the Department of Garo, whence infection spread to Avignon in the north, and to Arles in the south. The first Commission, convened to consider the measures that should be taken to check the ravages of this pest, met in 1868. Since then, Commission after Commission has been held, and a library of books and reports have appeared. Every feature in the life-history of the insect has been elaborately worked out, but as yet no material progress has been made towards staying the fatal calamity that has through this minute insect overtaken viticulture, and which is yearly extending its baneful influence. The rapidity with which it has spread over the greater part of the globe may be appreciated, when it is stated that the progeny of a single individual has been estimated to become in one year 5,904,000,000. The full-grown insect is almond-shaped and measures 1-30th of an inch in length by 1-50th in breadth.

Peculiarities. 268

Peculiarities and Characteristics.—The Phylloxeridæ, says Mr. A. Murray, are intermediate between the Coccidæ and Aphides. In the early part of its cycle the Vine Louse appears under two distinct forms, both wingless, the one having tubercles on the back and the other destitute of these. The former is found exclusively on the roots, the latter exclusively on the leaves. Mr. Riley and other entomologists have clearly demonstrated that these are one and the same insect and, indeed, the roots have been infected with the leaf form. These insects are, however, so small that they can scarcely be seen by the naked eye, but under a lens appear of a fleshy texture and light yellowish brown colour. The condition found on the roots

ECULIARITIES of the ne Louse.

method.

The course now being largely tried took its origin in the observation made by Mr. Riley, that certain American vines were less readily attacked by Phylloxera ... ants] upon ... us purpose ... River Bank ... mentioned ... other two ... dling, the ... ware, the Clinton, etc. ... the most recent author on Vines—V. riparia, Michx, includes V. vulpina, L, V incisa, Jacq., and V. cordifolia var. β riparia. While V. palmata, Vahl., and V. vi... onis, Planch, is ... at the present ... ther grapes. It ... vines (unless ... immunity from this great scourge. The course known as the American ... when it is ... as a grafting stock), has by Planchon been regarded as identical with V. vulpina, L., a form which is probably scarcely distinct from the Indian species, V. parvifolia, Roxb.

Hybrid. Conf. with pp. 256, 260.

Conf. with p. 275.

2. Oidium Tuckeri.

VINE MILDEW.

This disease is said to have been known in America long before it was observed in

Vine Mildew. 269 Conf. with pp. 268, 269.

VITIS vinifera.

Diseases which infect

DISEASES. Vine Mildew.

Europe. It was first seen in England, at Ramsgate, in 1847 by a gardener of that town in honour of whom the **Rev. M. J. Berkeley** gave it the name it is now known by. It was detected in France in 1848. By 1851 it had spread over all the vineyards of Europe, and in the following year it had reached Madeira. From the remarks made above, regarding vine-growing in Kanáwar, in the North-West Provinces, it will be seen that **Dr. Cleghorn** identified the disease that had done so much harm there (from 1855 to 1860) as **Oidium**. There is no direct evidence in support of an importation of that disease by India from Europe or America, however, and it is therefore quite possible that **Dr. Cleghorn** may have been mistaken. It is, therefore, all the more to be regretted that this subject should, for so many years, have been left in a state of complete neglect, for, if the disease of Kanáwar be actually **Oidium**, it is by no means necessary to carry to India (as has been proposed) American vines in the hope of curing a malady which a few pounds of sulphur would accomplish more thoroughly and economically.

The vine mildew appears to the naked eye like a coating of white powder, resting on the leaves, twigs, and fruit. The diseased parts are often seen to be pale-coloured and distorted; the coat grows in thickness and the patches become brown. On inspection through a microscope the surface of the affected part is seen to have the filaments of a fungus spread over the epiderm-cells, and further that from the sides of the filaments proceed little suckers which are pushed into the epiderm-cells to draw from these the nourishment needed by the fungus. From the upper side of the prostrate filaments arise erect branches, each formed of a row of cells, of which the terminal ones are conidia cells. These, on separating, furnish the spores, which, falling on the vine leaves, extend the malady. No other mode of reproduction has as yet been detected, though, as suggested by **Mr. Berkeley**, this curious fungus may belong to a more fully-developed state, such as the common **Erisyphe communis**.

Conf. with so-called Blight, pp. [illegible]

Plants suffering from this disease have a mouldy disagreeable smell. The fungus spreads rapidly in moist weather, is checked by dry air or heavy rain, but seems to be most frequent when warm, moist weather succeeds on damp cold sunless days with a stagnant atmosphere. Where mildew has appeared, the only effectual cure is sulphur or certain preparations of sulphur. The modern usage regards the burning of sulphur, however, as dangerous, for although it will effectually kill the fungus, it may destroy the vine as well. The most successful method is to dust flowers of sulphur over the affected parts. This will, in the course of a few days, kill the fungus, when the plant should be thoroughly washed, otherwise the grapes may be injured.

3.—*Peronospora viticola.*

American Mildew.

270 AMERICAN MILDEW.

This parasitic fungus has been known on the American vines since 1834, but it was only introduced into Europe in 1878 on some vines intended to replace those destroyed by **Phylloxera**. It has since spread throughout France and Algeria. In its life-history it differs in no essential feature from **Peronospora infestans**—Potato Mildew or **Peronospora arborescens**—the Opium Poppy Blight (*see Vol. VI., 72-74*). America thus not only gave to Europe "the most dreaded and dreadful of all the insects which attack the vine," but in her efforts, to try and eradicate the injury already done, she added a further scourge in **Peronospora**. This fungus attacks the under-surfaces of the leaves of the vine, about the time of the vintage in August; they become brown and shrivelled as if scorched by the sun or bitten by the frost. When the fungus first appears it looks like irregular patches of a whitish colour, which soon change to a leaden or brown colour and seem as if dry. "The tissues of the leaf are traversed by mycelium, furnished with *haustoria* or suckers, for taking food from the cells; and the white spots bear myriads of the erect, fruiting branches of the fungus, each repeatedly divided into three, less often into two branches. The terminal branches are short, and on the tip of each is an egg-shaped spore. In the spore there grow five or six smaller spores (zoospores), which escape by the bursting of the cell-wall of the spore, and can swim about in dew-drops and moisture of any kind; and at last the zoospores settle down on the leaves, push a slender tube through the epiderm, and give rise to a new plant. The diseased vines produce defective crops of fruit. The grapes also may be attacked. The resting, or sexual spores of the fungus have been found in **Vitis æstivalis**; they have a thick, smooth, yellow coat" (*Nicholson, Dict. of Gardening*). As is well known in the case of the potato mildew, sexual spores (*Oogonia* and their contained *Oospores*) are not essentially necessary for the perpetuation of a fungus of the class here dealt with (*see Vol. VI., 73*), provided portions of the mycelium be sufficiently protected throughout the winter in perennial

DISEASES.

American Mildew.

[illegible] on [illegible] e, [illegible] M. [illegible] ie [illegible] see [illegible] gained by the copper treatment. [illegible] in the tissue, and therefore beyond the reach of [illegible] any other external application.

In addition to the three diseases described above, the vines of Europe and America are subject to the injurious visitations of many other pests, both of an insect and fungoid nature. Of the former may be mentioned by name the Red Spider (Tetranychus telarius), The Thrips (Thrips minutissima); The Mealy Bug (Dactylopius adonidum), The Vine Scale (Pulvinaria or Coccus vitis); The Vine Beetle (Lethrus cephalotes), The Vine Weevil (Curculio Betuleti), and the Vine Tortrix or Moth (Tortrix vitisana). Of fungoid diseases many more have been described. The roots have been found destroyed by four fungi, *viz.*, the Rhizomorpha stage of Agaricus melleus; Dermatophora necatrix; Roesleria hypogœa; and by Fibrillaria xylotricha. Glœosporium ampelophagum often does great damage. It manifests itself by dark spots on the young shoots and leaves. These spots are at first round, but they soon become confluent. The centre becomes paler coloured or even pinkish-grey, owing to the pustles rupturing and discharging their conidia. This often does great injury, even killing the plant, but it is effectually cured by painting the stems in winter with a 10-15 per cent solution of sulphate of iron. Could this be the blight alluded to at page [illegible]?

Blight spoken of in connection with Bombay Vines. *Conf. with p. 278.*

The present brief notice of [illegible] fittingly be [illegible]

[illegible] conveniently indicated by Dr. [illegible] instructive remarks

Notes on the following [illegible]

[illegible] import a large [illegible] an opinion [illegible] by means of [illegible] are deposited [illegible] tal, and difficult [illegible]

[illegible] established by the Italian Govern- [illegible], although the precaution of disinfecting the c[illegible] taken. The process employed was the use of a ten per cent. solution of *sulpho-carbonate of potassium*; this is an *excellent process* [illegible] and I now know of none better, if the cuttings are left in the solution for a quarter of an hour. The two ends of the cuttings should previously be sealed with [illegible] or wax. Theoretically this is very good, but in application it may [illegible] that the solution *does not wet every portion*, especially the [illegible] by the buds. At such points therefore the poison would have no effect, although it is [illegible] these points that the insect selects through its instinctive care for the safety of its progeny. The Italian Government wished this incident to be [illegible] with the greatest discretion, and consequently the newspapers made very little mention of it.

Phylloxera then only existed in the [illegible] Italy, and the whole of the nursery on the island was destroyed [illegible].

Another process of disinfection has been [illegible] by MM. [illegible] and Couanon. It is based on the fact that a [illegible]

VITIS vinifera.

DISEASES.

American Mildew

Diseases which infect the Vine Plant

122° Fahrenheit) is fatal to organic bodies. The cuttings are plunged for from 10 or 15 minutes in water at the above temperature, and those eggs which are on the surface would be killed, the cutting being only partially heated, the vitality of the vine is not injured. Doubtless, theoretically, this process is much simpler than the other, and seems much easier of application, but if the temperature is only a little lower than it should be, the action may be absolutely *nil*, and this is what happens if bundles of cuttings are operated on. It is impossible to obtain a temperature of 50 in the middle of the bundles, and the cuttings should therefore be plunged in small lots and in a large quantity of water.

When the *sulpho-carbonate* is used, the cutting bears distinct evidence which proves the reality of the treatment, but if hot water be used there is no such evidence. This *proof* of the treatment is very useful, not in order to prevent fraud, but merely for fear of any forgetfulness, through which a bundle of untreated cuttings might accidentally become mixed with the bundles of treated cuttings. The safest plan, however, seems to be to procure the cuttings of American vines from a region which is still free from **Phylloxera**. There are still such regions in France, and the appropriate methods of disinfection should still be applied. Of course the danger is not so great now that **Phylloxera** does exist at the Cape, and especially if the cuttings are to be taken into a district which is already contaminated.

2nd, CRYPTOGAMIC DISEASES (*Anthracnosis, Peronospora, Rot.*).—These different diseases, which do not as yet exist at the Cape, are very much to be dreaded, and every possible precaution against their introduction should be taken.

Against **Anthracnosis** a concentrated solution of sulphate of iron, acidulated with sulphuric acid, is used. The sulphate of iron should be freshly prepared in a 50 per cent. solution; the sulphuric acid should be added in the proportion of one per cent., and the cuttings should be painted with the solution by means of a brush or a rag. This method is preventive, and is said to be efficacious.

Against **Peronospora** copper is a sure and very efficacious remedy. Cuttings do not generally seem to be attacked by this disease, and I do not think they are ordinarily capable of transmitting its germs. It is necessary to insist on the absolute cutting away of all tendrils which have been herbaceous and may contain the dormant spores of the parasite. The thin, and often dry, extremities of the cuttings which have for a long time remained herbaceous should also, for the same reason, be cut away before they are packed. If these cuttings are plunged in a solution of sulphate of copper the **Peronospora** would probably be destroyed, or, if not, the presence of the salts of copper would destroy it in case the dormant spores were to germinate. A 10 per cent. solution ought to suffice.

Physalospora Bidwellii: Coniothyrium Diplodiella.—These two new diseases, which have been recently observed in some of our vineyards, have been identified as the *Black Rot* and the *Grey Rot* of the Americans. They principally attack the grapes, but also the leaves. The salts of copper act effectually in their case also, but the doses should be strong. One application of the sulphate of copper bath would thus get rid of them. It would be quite possible to carry out the sulphate of copper and the sulphate of iron treatment in one and the same operation.

It may be asked, what influence would the climate of the Cape have on the germs of diseases which might be transported in the form of eggs or spores, on the cuttings? What influence is likely to be exerted by the voyage, and the high temperature which the cuttings will have to pass through on their journey?

As regards **Phylloxera**, this disease could only exist in the state of winter eggs. The temperature during the journey might doubtless cause the hatching of these eggs. But if the young insects do not meet with any tender and herbaceous parts they would probably perish. There is some reason to fear that the cuttings during this period might begin to vegetate, and might thus just supply the food required by the insects which greedily devour the aërial portions of the American vines. Therefore any parts of the cuttings which have begun to vegetate must be remorselessly removed and destroyed on the spot, after which it is prudent to apply the sulpho-carbonate treatment.

Are these different courses of treatment likely to have any influence on each other? Might they neutralize or destroy the action of one another?

The two salts of copper and iron, and the sulphuric acid which is added to the solutions may co-exist separately and act together without producing any inert compound by their reciprocal reaction. But it is not the same with the sulpho-carbonate and the salts in question. It would therefore be well to carry out in Europe before the

voyage the treatment with the sulphates. It would only be on the arrival of the vines at their destination that the treatment with sulpho-carbonate would take place The mutual reaction would then produce two inert precipitates (the sulphides of copper and iron), which would have no effect on the fungi. It would therefore be well to leave a considerable interval, such as that of the voyage between the two treatments in order to allow the saline solutions to act for a longer period on the cuttings." DISEASES. American Mildew.

TRADE IN WINE AND BRANDY.

TRADE. 271

This may be said to be very unimportant when the immense population of India is taken into account The consumption of foreign wines and spirits may, in fact, be said to be almost nominal.

Statement of the Imports from Foreign Countries of Wines, Brandies, etc.

	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	
	R	R	R	R	R	Gallons.
WINES—						
Champagne						44,889
Claret .						113,866
Port .						77,908
Sherry .						42,672
Other Sorts						82,671
BRANDY .	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	323,237
LIQUEURS .	1,58,078	1,62,129	1,63,775	1,60,391	1,69,154	11,587
TOTAL .	62,36,274	61,04,100	59,65,208	55,31,914	56,30,992	696,920

It does not seem necessary to do much more than exemplify the countries of supply and the shares taken in the trade by the provinces of India during the last year of the above series.

King- 272
don 11,201
gall Kong,
etc. Of the receiving provinces, Bengal took 18,339 gallons, Bombay 13,184 gallons, Sind 5,747 gallons, Madras 4,587 gallons, and Burma 3,032 gallons.

France 42,444 273
its Settlements
Australia, 743
Greece, Egypt,
Bengal 38,820
, Sind 10,464

Port.—The United 274
67,706 gallons, France
and the provinces it su
more port than Bengal,
Bengal, 14,034 gallons t
to Burma.

Sherry—The United Kingdom furnished 34,851 gallons, Spain 3,987 gallons, Malta 1,544 gallons, Germany 1,290 gallons, and 281 gallons from the Straits Settlements. The receiving provinces were Bombay 275

VITIS: Wine.

Trade in Wine and Brandy.

TRADE. 15,759 gallons, Bengal 14,110 gallons, Sind 5,171 gallons, Madras 5,028 gallons, and Burma 2,604 gallons.

276 *Brandy.*—The United Kingdom contributed 173,317 gallons, France 110,590 gallons, Germany 27,902 gallons, Belgium 10,293 gallons, Egypt 343 gallons, Italy 274 gallons, Ceylon 120 gallons, Straits Settlements 228 gallons, and very much smaller quantities were obtained from Spain, Malta, Aden, China, and Japan. The receiving provinces were Bombay 114,525 gallons, Bengal 81,856 gallons, Burma 57,404 gallons, Madras 36,143 gallons, and Sind 33,306 gallons.

277 It is perhaps undesirable to analyse the returns of liqueurs and other sorts of wines; sufficient has perhaps been indicated to show the position and extent of the Indian consumption of foreign wines and spirits. One of the most remarkable modern features, perhaps, has been the decline of the consumption of brandy and the substitution of whisky, especially so in Bengal.

Kashmir Wine. 278 Conf. with pp. 261, 273. CONSUMPTION of Wines and Spirits in India.

Although Kashmir wine has been shown at several exhibitions, and has commanded high commendation, still it may be said that India practically produces no wine, so that the foreign imports represent her total consumption—a remarkably small consumption when compared with that of almost any country in Europe. Of course the imports here shown by no means represent the total consumption of alcoholic beverages, but they denote the extent to which it can be said that India is learning the "craving" for foreign wines and brandies. The amount of whisky imported last year was slightly in excess of the brandy, namely, 338,637 gallons, of which Bengal took 141,412 gallons; the gin imports were 70,257 gallons, Burma having taken the largest share, *viz.*, 29,347; and the rum imports were 27,402 gallons, of which Burma took 19,051 gallons. The total amount of brandy, whisky, gin and rum imported by India in 1890-91 was, therefore, 809,553 gallons. For some years past Government has practically imported no wines nor spirits, so that the above, less the re-exports, might be assumed to represent the consumption, since the stock in hand may be regarded as a fairly constant quantity. The exports of Indian spirits of all sorts were last year 34,975 gallons, and the re-exports of foreign spirits came to 11,577 gallons, so that the net import from foreign sources would have been close on 800,000 gallons. As in all other countries, India has two items of revenue from alcoholic beverages, *viz.*, a customs due on imports from foreign countries and an excise duty on local manufactures. The imports yielded a customs revenue last year of close on £600,000, but the corresponding receipts by Great Britain and Ireland on their imports came to over £6,000,000. The total customs and excise revenue of India in 1890-91 on wines, spirits and beers, etc., was a little over five millions, or if the receipts derived from the Indian consumption of opium and drugs be added, the total customs and excise income may be said to have been a little over six million pounds sterling, or one-fifth the corresponding revenue obtained in the United Kingdom. Thus the approximately 300 million inhabitants of India afforded a revenue to their country, from these sources, which was one-fifth only of that paid by the less than 30 millions of the mother country. From these facts some idea of the relative consumption of intoxicants in Great Britain and India may be obtained, but were the value of the articles consumed to be taken into consideration, the comparison would manifest still more seriously the luxury, and it might almost be called the alcoholic indulgence of the United Kingdom. (*Conf.* with article Narcotics, Vol. V., 332-338, but in table on page 338 for "Rs." read "Rx.")

Vitriol, Blue,—see Sulphate of Copper; Vol. II., 649.

Vitriol, Green,—see Sulphate of Iron; Vol. IV., 523.

Vitriol, WHITE,—see Sulphate of Zinc.

VOLUTARELLA, *Cass.; Gen. Pl., II., 476.*

Volutarella divaricata, *Benth.; Fl. Br. Ind., III, 383; Wight, Ic.*, [*t. 1139*; COMPOSITÆ. 279

Syn.—TRICHOLEPIS PROCUMBENS, *Wight*, T. CANDOLLEANA, *Wight*; MICROLONCHUS DIVARICATUS, *DC.*; CENTAUREA DIVARICATA, *Wall.*; CARDUUS RAMOSUS, *Roxb.*

Vern.—*Bádáward*, PERS. & BOMB.

References.—*Roxb., Fl. Ind., Ed. C B C, 595; Dalz. & Gibs., Bomb. Fl., 131; Dymock, Mat. Med. W. Ind., 2nd Ed., 466.*

Habitat.—An annual, straggling, stiff weed, found in Central, North-Western, Western, and Southern India, from Behar and the Upper Gangetic plain to Lahore, and from Sind to Mysore and the Deccan, ascending to 3,000 feet in the North-West Himálaya.

Medicine.—Dymock informs us that this PLANT is described by Muhammadan writers as the *shau kat-el-baida* of the Arabs, the *lufinik* of the Turks, and the *sanakhurd* of the Syrians, and is also known in Persian as *kangar-i-sufed* and *asfar-i-barí*. It is considered by these writers to have tonic, aperient, and deobstruent properties, and to have the power of driving away noxious reptiles, when kept in a house (*Makhzan-el-Adwiya*). The indigenous plant does not appear to be known nor valued in India, but the dried drug is imported into Bombay from Persia (*Mat. Med. W. Ind.*). MEDICINE. Plant 280

(*J. Murray*)

WAGATEA, *Dalz.; Gen. Pl., I., 568.*

Wagatea spicata, *Dalz.; Fl. Br. Ind., II., 261; Wight, Ic., t.* [*1995*; LEGUMINOSÆ. I

Syn.—CÆSALPINIA MIMOSOIDES, *Heyne*; C. FEROX, *Hohen.*

Vern.—*Wákeri*, MAR.; *Wakiry, wagati*, BOMB.; *Vágáti*, KAN.

References.—*Dalz. & Gibs., Bomb. Fl., 80; Gamble, Man. Timb., 135; Lisboa, U. Pl. Bomb., 217; Gazetteer, Bombay, XV., 79; Wardle, Letter on the Pods as a Tanning material.*

Habitat.—A robust, woody, prickly, climbing shrub, found on the Western Gháts.

Tan.—The PODS contain a large proportion of tannic acid, and promise to become a commercial tan of some importance. Samples were sent for examination to Mr. Wardle who, in a letter to Sir Louis Mallet, May 15th, 1879, wrote as follows:—"In these pods the relation by weight of the seeds to the husks is as 28 to 23, that is, 51 parts by weight of pods containing seeds consist of 28 parts seed and 23 parts husk or outer shell. If the seeds could be extracted from the pods when the latter are ripe, the husks would have the same value as sumach. I have used Luventhal's permanganate of potash process which gives the permanganate value and is reliable. Processes professing to give percentages of tannin are liable to error from each vegetable substance containing tannin of varying properties and constitution, which affects their accuracy. But, to prevent confusion, I have added the percentages of tannin calculated from the permanganate values. TAN Pods. 2

"The figures showing the permanganate values represent the number of cubic centimetres of half decinormal solution of potassic permanganate

TAN. equivalent to the tannin contained in 20 c. c. of an infusion of 5 grammes of the substance to be analysed, in one litre of water:—

Estimation of tannin—	Permanganate values of tannin,—accurate.	Percentages of tannin reliable only *inter se*.
—in seeds alone	0·7	2.13
—in pods alone	6.15	19·17
—in pods and seeds together	3.1	9·66"

OIL. Seeds. 3 **Oil.**—Lisboa writes, "An oil used in lamps is obtained from this plant." The writer can find no further information as to this oil, but it is extremely probable that it is obtained from the SEEDS. If this be so, and if the oil be of any value, the seeds extracted from the pods in gathering the latter for tanning purposes, would be removed from the category of waste material to that of useful commercial products, and would thus enable the pods to be obtained more cheaply. Both the pods and the oil are worthy of attention.

WALKING STICKS.

4 **Walking Sticks,** Timber used for—

Balanites Roxburghii, *Planch.*; SIMARUBEÆ.
Bamboos, various species; GRAMINEÆ.
Cassia siamea, *Lamk.*; LEGUMINOSÆ.
Cocos nucifera, *Linn*; PALMÆ.
Cotoneaster acuminata, *Lindl.*; ROSACEÆ.
C. bacillaris, *Wall.*
Dichrostachys cinerea, *W. & A.*; LEGUMINOSÆ.
Diospyros Kurzii, *Hiern.*; EBENACEÆ.
Dodonæa viscosa, *Linn.*; SAPINDACEÆ.
Grewia populifolia, *Vahl.*; TILIACEÆ.
Juniperus macropoda, *Boiss.*; CONIFERÆ.
Parrotia Jacquemontiana, *Dcne.*; HAMAMELIDEÆ.
Prinsepia utilis, *Royle*; ROSACEÆ.
Prunus Puddum, *Roxb.*; ROSACEÆ.
Pyrus Pashia, *Ham.*; ROSACEÆ.
Sarcococca pruniformis, *Lindl.*; EUPHORBIACEÆ.
Staphylea Emodi, *Wall.*; SAPINDACEÆ.
Zanthoxylum alatum, *Roxb.*; RUTACEÆ.

For information as to these, the reader is referred to the article on each in its respective alphabetical position.

WALLICHIA, *Roxb.*; *Gen. Pl.*, *III.*, *916.*

[*VI.*, *419*; PALMÆ.

5 **Wallichia caryotoides,** *Roxb.*, *Cor.*, *Pl. III.*, *t. 295*; *Fl. Br. Ind.*,

Syn.—HARINA CARYOTOIDES, *Ham.*; WRIGHTIA CARYOTOIDES, *Roxb.*, *Hort. Beng.*

6 **W. densiflora,** *Mart.*; *Fl. Br. Ind.*, *VI.*, *419.*

Syn.—HARINA OBLONGIFOLIA, *Griff*; W. CARYOTOIDES, *Wall.*

Vern.—*Kala aunsa* (black reed), *gor aunsa*, KUMAON; *Oh*, *úh*, LEPCHA; *Takosu*, NEP.; *Zanoung*, BURM.

References.—*Griffith, Palms of Br. E. Ind.*, *t. 237, a. b. c.*; *Brandis, For. Fl.*, *549*; *Gamble, Man. Timb.*, *419*; *Kurz, For. Fl. Burm.*, *II.*, *532*; *Ind. Forester, VIII.*, *407*; *XI.*, *6.*

Habitat.—The former species is a native of Chittagong and Burma The latter is a small, stemless palm, common in the outer Himálaya, from Kumáon eastwards, up to 4,000 feet; also found in Eastern Bengal and Chittagong. The two species are closely allied and have the same properties.

Fodder.—In Darjiling the LEAVES are used as fodder for poneys. FODDER. Leaves 7

Domestic.—In Kumáon the LEAVES are employed for thatch. DOMESTIC. Leaves. 8

Wallichia disticha, *T. And., in Linn. Soc. Jour., xi., 49, p. 6; Fl. Br. Ind, VI, 419.* 9

Syn.—W. YVONÆ, *Kurz.*

Vern.—*Katong*, LEPCHA

References.—*Gamble, Man. Timb, 419, Cat. Pl. Darjiling, 84*

Habitat—A handsome palm of the outer hills of Sikkim, and probably eastward to Pegu.

Food.—The Lepchas fell the tree to eat the PITH of the stem near its summit. Anderson remarks that the BERRIES and perhaps the LEAVES irritate the skin (*Gamble*). FOOD Pith 10 Berries. 11 Leaves. 12

Walnut, see Juglans regia, *Linn.*; Vol. IV., 549; JUGLANDEÆ.

WALSURA, *Roxb.; Gen. Pl., I., 336.*

Walsura piscidia, *Roxb.; Fl. Br. Ind, I., 564;* MELIACEÆ. 13

Syn.—TRICHILIA CORIACEA, *Rottl.*, T. TRIFOLIATA, *Wall*, HEYNEA TRIFOLIATA, *A. Juss.*

Hal

to be [illegible] Burma (*Mc'Lelland*; *Mason*). Kurz, however, does not describe it as found in Burma, so probably the above refers to some other species.

Medicine.—Corre & Lejanne state that in the Antilles the tree is known as *Herbe à mauvaise gens* or *Herbe à méchants*, and that the BARK acts as a dangerous emmenagogue and violent emetic. Mr. Hœlingsworth of Madras has experimented with it, and finds it to be stimulant and expectorant. The FRUIT of another species of the same genus is said by Forskhal to be the *jaus-el-kai* or the emetic nut of the Arabs, with whom it is also used as hair wash to kill vermin, and as an ointment to cure itch (*Pharmacog Ind.*). MEDICINE. Bark. 14 Fruit. 15

Chemical Composition.—The authors of the *Pharmacographia Indica* state that the bark contains a *resin* anhydride in the alcoholic solution. An aqueous extract contains *saponin*, and an alcoholic extract a large quantity of tannin CHEMISTRY. 16

Structure of the Wood—Heavy and strong, said to be good and used by the Natives of South India for various purposes. TIMBER. 17

Domestic.—Roxburgh, and following him many other writers, state that the BARK is largely employed to intoxicate fish, and that fish so caught are not less wholesome than ordinarily. Mr. Hœlingsworth, according to the authors of the *Pharmacographia Indica*, finds that it DOMESTIC. Bark. 18

DOMESTIC. acts effectually for this purpose, and corroborates the statement that the fish killed with it are quite wholesome.

19 **Walsura robusta,** *Roxb.; Fl. Br. Ind., I., 565.*

Syn.—MONOCYCLIS ROBUSTA, *Wall.*; SCYTALIA GLABRA, *Ham.*

Vern.—*Upphing*, SYLHET; *Gyopho, tsoukmayba*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 366; Kurz, For. Fl. Burma, I., 223; O'Shaughnessy, Beng. Dispens., 247; Agri.-Horti. Soc. Ind., Journ. (Old Series), VI., 41.*

TIMBER. 20 Structure of the Wood.—Light red, very hard; weight 63lb per cubic foot.

WATTLE BARK.

21 **Wattle Bark**—The bark of various species of Australian Acacias, used for tanning, but chiefly A. decurrens, *Willd.*—the Black Wattle—(Vol. I., 40), a species now being experimentally cultivated in several districts of India, chiefly on the Nilgiris. The "Golden" or "Broad leaf" Wattle - A. pycnantha, *Bth.*—is perhaps, next to the Black Wattle, the most valuable species for tanners' bark and gum. A. melanoxylon (Vol. I., 53) and A. dealbata—the Silver Wattle—(Vol. I., 46) are also much used. But A. floribunda, A. affinis, and others are amongst those that are now so largely exported to Europe as Tanners' Wattle; in fact, vast tracts of Acacia forest are fast disappearing in Australia. The destruction of these forests reached such an extent in 1878 that the Australian Government ordered the matter to be enquired into by a special Board. This resulted in the following recommendations:—that regulations should be framed so as to conserve the trees on crown lands; that wattle cultivation should be adopted by the State; and that certain areas of poor land should be leased on the stipulation that the whole of the land should be devoted to wattle cultivation. Many Indian species of Acacia possess barks of great value in tanning and are used in place of wattle (see Vol I., 17-61).

Wax, see Honey & Wax, Vol. IV., 263-271; also Oils, Vol. V., 448, [457, 458.

WEBERA, *Schreb.; Gen. Pl., II., 86.*

[*t. 309, 584, 1064;* RUBIACEÆ.

22 **Webera corymbosa,** *Willd.; Fl. Br. Ind., III., 102; Wight, Ic.,*

Syn.—W. ASIATICA, *Bedd.*; W. GLOMERIFLORA, *Kurz*; W. CERIFERA, *Moon.*; RONDELETIA ASIATICA, *Linn.*; CUPEA CORYMBOSA, *DC.*; STYLOCORYNE SP., *Wall.*; S. WEBERA, *A. Rich.*; S. RIGIDA, *Wight.*; POLYOZUS? MADRASPATANA, *DC.*; PAVETTA WIGHTIANA, *Wall.*

Vern.—*Kankra*, BENG.; *Jhanjhauka*, URIYA; *Kachuria chāll*, CUTTACK; *Komi*, TEL.; *Tarana, karani*, SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 234; Kurz, For. Fl. Burm., II., 47; Beddome, For. Man., 133; Anal. Gen., XVI., f. 2; Thwaites, En. Ceyl. Pl., 148; Dalz. & Gibs., Bomb. Fl., 119; Gamble, Man. Timb., 226; Rheede, Hort. Mal., II., t. 23; Agri.-Horti. Soc. Ind., Journ. (Old Series), VI., 48; Ind. Forester, X., 31.*

Habitat.—A large shrub or small tree, found in the Western Peninsula from the Konkan southwards, and in Ceylon.

RESIN. Shoots. 23 Resin.—The extremities of the young SHOOTS are often found covered with a white resinous matter (*Roxb.*).

TIMBER. 24 Structure of the Wood.—Yellowish-white, hard, close-grained; weight 57lb per cubic foot; used in Ceylon for making fishing-boats.

WEDELIA, *Jacq.*; *Gen. Pl.*, *II.*, 370.

Wedelia calendulacea, *Less*; *Fl. Br. Ind.*, *III.*, 306; *Wight*, [*Ic.*, *t.* 1107; COMPOSITÆ.

Syn.—VERBESINA CALENDULACEA, *Linn.*; JOEGERIA CALENDULACEA, *Spreng.* 25

Vern.—*Bhánra, bhángrá,* HIND.; *Kesraj, kesarája, kesuriá, bhimráj, bangra,* BENG.; *Piwalá maka,* MAR.; *Pilo bhangro, bhangaro,* GUZ.; *Pila-bungra,* DEC.; *Pivala bhangra,* BOMB.; *Postaley-kaiantagerai,* TAM.; *Bhringaraja, kesaraja, pita-bhringi,* SANS.; *Ranwan-kikirindi,* SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C.*, 606; *Dalz. & G.*, *Fl.*, 129; *Thwaites, En. Ceyl. Pl.*, 165; *U. C. Dutt, Mat. Med. ...*

... *Bomb.*

and ... *f. 1*;

ceo ... *engal*,

I ... stern

... of this plant are said ... camphora-

dyeing grey hair and for promoting its growth. McCann writes that, in Lohardagga, the ROOT is pounded and used as a black dye with salts of iron.

DYE. Leaves. 26 Root. 27

Medicine.—According to **Dutt** some confusion exists in the Sanskrit and vernacular names of this species and Eclipta alba, *Hassk* (*cf.* Vol. III, 201). Both are called *kesaraj* or *kesuriá* in Bengali, and the two Sanskrit names above given are employed as synonyms for both. The ... term, *bhángrá*, derived from the Sanskrit ... ally applied to the ... ustani ... gener- ... are re- ... skin ... as a ... para- ... used in the ... cough, catarrh, and affec- ... *Mat. Med. Hind.*).

MEDICINE. Leaves. 28 Juice. 29

Domestic.—The LEAVES and their JUICE are employed, as above stated, to dye and promote the growth of the hair. The juice is said to be used to tattoo the body, the colour produced being a deep, indelible, bluish-black (*U. C. Dutt*).

DOMESTIC. Leaves. 30 Juice. 31

WELL-CURBS.

Well-Curbs, Timbers used for—

Many timbers are employed for this purpose, but the following are the more important:— 32

Acacia arabica, *Willd.*; LEGUMINOSÆ.
Albizzia Lebbek, *Benth.*; LEGUMINOSÆ.
Barringtonia acutangula, *Gærtn.*, MYRTACEÆ.
Bombax malabaricum, *D.C.*; MALVACEÆ.
Butea frondosa, *Roxb.*; LEGUMINOSÆ.
Cordia Myxa, *Linn.*; BORAGINEÆ.
C. vestita, *Hook f. & T.*
Eugenia Jambolana, *Lam.*; MYRTACEÆ.
Ficus bengalensis, *Linn.*; URTICACEÆ.
F. glomerata, *Roxb.*
Gmelina arborea, *Linn.*, VERBENACEÆ.
Phyllanthus Emblica, *Linn.*, EUPHORBIACEÆ.
Populus euphratica, *Oliv.*; SALICINEÆ.
Prosopis spicigera, *Linn.*; LEGUMINOSÆ.

Soymida febrifuga, *Adr. Juss.*; MELIACEÆ.
Zizyphus Jujuba, *Lamk.*; RHAMNEÆ.

WENDLANDIA, *Bartl.*; *Gen. Pl., II., 50.*

33 **Wendlandia exserta,** *DC.*; *Fl. Br. Ind., III., 37*; RUBIACEÆ.

Syn.—W. CINEREA, *DC.*; RONDELETIA EXSERTA, *Roxb.*; R. CINEREA, *Wall.*

Vern.—*Chaulai, chila, chilkiya, tila, birsa, tilki, tilai,* HIND.; *Hundro, pichari baha,* SANTAL; *Kangi, tilki, mimri,* NEPAL; *Kúrsi,* SEONI; *Marria,* GOND; *Tilliah,* BAIGAS in MANDLA; *Pansira, pudhárá, chilkiyá,* PB.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 176; Beddome, For. Man., 130; Brandis, For. Fl., 268; Gamble, Man. Timb., 225; Stewart, Pb. Pl., 117; Rev. A. Campbell, Rept. Econ. Pl., Chutia Nagpur, Nos. 7542, 9283; Atkinson, Him. Dist., 311; Gazetteer, N.-W. P., IV., lxxiii.; Ind. Forester, III., 203; IV., 241; VIII., 412; XIV., 343; Agri.-Horti. Soc. Ind., Journ. (Old Series), XIII., 319.*

Habitat.—A small, deciduous tree of the Sub-Himálayan tract, from the Chenab eastwards to Nepál and Sikkim; also found in Oudh, Bengal, Central and Southern India.

FODDER. Leaves. 34 Fodder.—In certain localities the LEAVES are given as fodder to cattle.

TIMBER. 35 Structure of the Wood.—Reddish-brown, extremely hard, close grained, fibrous and tough; weight 47lb per cubic foot. Though small it is used for building and for making agricultural implements, and in the Sikkim Tarai, for house-posts.

36 **W. Notoniana,** *Wall.*; *Fl. Br. Ind., III., 40*; *Wight, Ic., t. 1033.*

Vern.—*Rameneidelle* or *rawan-idala,* SING.

References.—*Beddome, Fl. Sylv., t. 224; Dalz. & Gibs., Bomb. Fl., 117; Thwaites, En. Ceyl. Pl., 159; Trimen, Cat. Ceylon Pl. 41; Gamble, Man. Timb., 225; Gazetteers:—Mysore & Coorg, I., 70; Bombay, XV., 435.*

Habitat.—A small tree, common on the hills of South India and Ceylon, ascending to 7,000 feet.

TIMBER. 37 Structure of the Wood.—Red, and similar in structure to that of W. exserta; it is strong and used for various purposes by the Natives of Southern India.

38 **W. tinctoria,** *DC.*; *Fl. Br. Ind., III., 38.*

Syn.—RONDELETIA TINCTORIA, *Roxb.*

Var. normalis=W. PROXIMA, *DC.*; RONDELETIA PROXIMA, *Don.*

Var. grandis=W. BUDLEOIDES, *Wall.*

Vern.—*Túla-lodh,* BENG.; *Tilai,* SANTAL & KOL.; *Kangi,* NEPAL; *Singnok,* LEPCHA; *Telli,* URIYA; *Tamayoke,* BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 175; Kurz, For. Fl. Burm., II., 74; Beddome, For. Man., 130; Brandis, For. Fl., 269; Gamble, Man. Timb., 225; Rev. A. Campbell, Rept. Econ. Pl., Chutia Nagpur, No. 8439; Darrah, Note on Cotton in Assam, 32; Ind. Forester, III., 203; VIII., 416; Agri.-Horti. Soc. Ind., Journ. (Old Series), IX., Sel., 45.*

Habitat.—A small, elegant tree, with large crowded panicles of small white, sweet-scented flowers, terminating the boughs; common in the forests of the Tropical Himálaya from Garhwál eastwards, and from Oudh and Bengal to the Khásia Mountains, Assam, Chittagong, Pegu, and Tenasserim.

DYE. Bark. 39 Dye.—The BARK is largely employed in Bengal and Assam as a mordant in dyeing. The specific name, which would naturally imply that

m this

xternal MEDICINE. Bark 40

(J. Watt)

WHALES, PORPOISES, DOLPHINS, & DUGONGS; *Blanford, Fauna Br. Ind., Vol. I., 564-594.* 41

The aquatic MAMMALIA which, as a matter of convenience, have been grouped together in this place, belong to two very distinct Natural Orders—the CETACEA and

The CETACEA have been referred to two sub-orders:—

I.—Mystacocœti. *These have no teeth after birth, baleen present, breathing-orifice double.*

The following are the genera of this sub-order, BALÆNOPTERA, and MEGOPTERA

II.—Odontocœti. *Teeth present throughout life; no baleen; breathing-orifice single.*

This sub-order has been referred to three families with the genera named below under each:—

PLATANISTA.

The SIRENIA, so far as India is concerned, are represented by one genus, the HALICORE.

The more important species of the above genera may now be dealt with very briefly in alphabetical order, as is customary in this work.

1st, Balænoptera edeni, *Anderson; Blanford, Fauna of British India, I., 568.* 42

- THE SMALLER INDIAN FIN-WHALE.

Habitat.—Bay of Bengal. This is probably identical with B. rostrata. The adults are about 40 feet long.

2nd, B. indica, *Blyth; Blanford, Fauna of British India, I, 567.* 43

THE GREAT

Habitat —Bay
all known animals
identical with the
80 to 90 feet.

44 3rd, **Delphinus delphis**, *L.*; *Blanford, Fauna of British India, I., 587.*
THE COMMON DOLPHIN.
Vern.—*Pamigra*, TAM.
Habitat.—Tropical and Temperate seas. In India recorded only from the Madras coast.

45 4th, **D. dussumieri**, *Blanford, Fauna of British India, I., 588.*
THE INDIAN LONG-NOSED DOLPHIN.
Habitat.—Malabar Coast.

46 5th, **D. malayanus**, *Lesson; Blanford, Fauna of British India, I., 588.*
THE MALAY DOLPHIN.
Habitat.—Indian Ocean; has been captured in the Sunderbans.

47 6th, **Globicephalus indicus**, *Blyth; Blanford, Fauna of British India, I., 577.*
THE INDIAN PILOT WHALE.
Habitat.—This species, which is nearly allied to **G. melas** of the European seas, has been captured in the brackish water of the Gangetic delta.

48 7th, **Gogia breviceps**, *Gray; Blanford, Fauna of British India, I., 572.*
THE SMALL SPERM-WHALE.
Vern.—*Wongu*, TEL.
Habitat.—Found in the Indian and Australian seas. The type of the species was captured at Vizagapatam.

49 8th, **Halicore dugong**, *Illiger.; Blanford, Fauna of British India, I., 594.*
THE DUGONG OR DUYONG.
Vern.—*Talla mala, muda ura*, SING.; *Duyong, parampuan laut*, MALAY.
Habitat.—The shores of the Indian Ocean from East Africa to Australia for about 15 degrees on each side of the Equator. They have been seen on the coast of Malabar, the Andaman Islands, Mergui Archipelago, and Ceylon. They feed on marine algæ and haunt shallow bays, but do not ascend rivers.
OIL. 50 **Oil.**—The part of this animal yields a clear limpid oil of great value.
FOOD. Flesh. 51 **Food.**—The FLESH is regarded as excellent.

52 9th, **Lagenorhynchus electra**, *Gray; Blanford, Fauna of British India, I., 580.*
THE INDIAN BROAD-BEAKED DOLPHIN.
Habitat.—Indian and Tropical Pacific Ocean. Collected at Vizagapatam by Sir W. Elliot.

53 10th, **L. obscurum**. *True; Blanford, Fauna of British India, I., 580.*
THE BEAKLESS DOLPHIN.
Habitat.—Indian and Pacific Oceans.

54 11th, **Phocæna phocænoides**, *Blanford, Fauna of British India, I., 574.*
THE LITTLE INDIAN PORPOISE.
Vern.—*Malagan*, TAM.; *Bhulga*, MAR.
Habitat.—The shores of the Indian Ocean from the Cape of Good Hope to Japan. The tidal rivers of Bengal, Madras, Malabar, Bombay, and Karachi.
55 According to Mr. W. F. Sinclair of Bombay, it feeds chiefly on prawns, cephalopods, and fish, and is generally seen singly or not more than four or five together. "The roll of this porpoise is like that of **Phocæna communis**. It does not jump or turn summersaults like **Platanista** and the **Dolphini**, and is, on the whole, a sluggish little porpoise."
The genus NEOMERIS into which this animal has been placed, by some zoologists, differs only from **Phocæna** by having no dorsal fin.

12th, Physeter macrocephalus, *L.; Blanford, Fauna of British India, I, 571.* 56
THE SPERM-WHALE OR CACHALOT.

Habitat.—Found in nearly all tropical and sub-tropical seas, and was formerly much hunted in the Bay of Bengal and off the coast of Ceylon Blanford says that the only recorded case of one having been stranded on the Indian coast was at Madras in 1890.

It is found in the open sea, generally in herds of from 10 to 15 or sometimes in very much larger numbers. The old males are said to live apart. Sperm-whales have been killed in the Atlantic with harpoons, that had been left in them in the Pacific Ocean.

Oil.—SPERMACETI AND AMBERGRIS—Spermaceti is obtained from the head, sperm-oil from the blubber, and ambergris from the intestines, though it is sometimes found floating on the sea. See the general remarks in the concluding paragraphs. OIL. 57

13th, Platanista gangetica, *Gray; Blanford, Fauna of British India, I., 590.* 58
THE GANGETIC and INDUS DOLPHIN.

Hiho, seho,
SANS.
their larger
trib Dolphin is
con believed not
to be gregarious, although several individuals may often be seen together.
in the
)ctober
would
found.

urning OIL. 59
and other purposes.

Food.—The FLESH is eaten by certain castes. It is captured in nets or by harpooning. FOOD. Flesh 60

14th, Orca gladiator, *Gray; Blanford, Fauna of British India, I., 576.* 61
THE GRAMPUS OR KILLER.

Habitat.—Doubtfully found in Indian seas.

15th, Orcella brevirostris, *Anderson; Blanford, Fauna of British India, I., 578.* 62

H s as far as the tide extend

16th, O. fluminalis, *Anderson; Blanford, Fauna of British India, I., 579.* 63
THE IRRAWADDY PORPOISE.

Habitat.—The Irrawaddy river. A gregarious species very similar to O. brevirostris but with the dorsal fin placed further back, also smaller, lower and less falcate and with the pectoral fins rather shorter and broader.

17th, Steno frontatus, *Blyth; Blanford, Fauna of British India, I., 582.* 64
THE ROUGH TOOTHED DOLPHIN.

Habitat —Indian and Atlantic Oceans. Captured in the Bay of Bengal.

18th, S. lentiginosus, *Owen, Blanford, Fauna of British India, I., 584.* 65
THE SPECKLED DOLPHIN.

Vern.—*Bolla gadimi,* TEL.

Habitat.—Indian seas. It has been captured at Vizagapatam and at Alibag, Bombay.

66 19th, Steno? maculiventer, *Owen; Blanford, Fauna of British India, I.,* [585.

Habitat.—A doubtful species recorded from Vizagapatam.

67 20th, S. perniger, *Blanford; Fauna of British India, I., 583.*

ELLIOT'S DOLPHIN.

Vern.—*Gadamu*, TEL.

Habitat.—Indian Ocean. Captured at Vizagapatam, Karachi, Australia, etc.

68 21st, S. plumbeus, *Blanford; Fauna of British India, I., 583.*

THE PLUMBEOUS DOLPHIN.

Vern.—*La-maing*, BURM.

Habitat.—Indian Ocean. Recorded from Madras, Malabar Coast, Karachi, Burma, and Ceylon.

69 22nd, Tursiops tursio, *Flower; Blanford, Fauna of British India, I., 581.*

THE COMMON BOTTLE-NOSE PORPOISE.

Habitat.—Probably throughout temperate and tropical seas. Blyth records the skull of one captured in the Bay of Bengal.

OCCURRENCE 70 The economic facts regarding *1st*, the Dolphins and Porpoises may be here briefly reviewed and on the next page those of *2nd*, the Whales.

OCCURRENCE.—*1st*, "The Dolphins or Porpoises, as they are popularly called (the word dolphin is often restricted to the fish Coryphæna, celebrated for its changeable tints when dying), are found all over the world inhabiting seas, and many ascending large rivers. They generally associate in flocks or shoals, are very active, swimming and playing near the surface of the sea, and feeding on fishes, crustacea, cuttle fish, etc. They frequently accompany ships for miles" (*Jerdon*). The Indian species of the genus Delphinus are recorded from the Bay of Bengal and the coast of Malabar, that of Globicephalus from the same sea near the Hooghly, and those of Platanista, from the Ganges and Indus, respectively.

OIL. Porpoise. 71 Black-fish. 72 Melon. 73

Oil.—From mammals belonging to this family is obtained the oil known in commerce as "porpoise oil," a term which includes "black-fish oil." It may be made from species belonging to any of the genera, but is principally obtained from the black porpoise, the white whale, and the grampus—all non-Indian or doubtfully Indian species. It may be noticed, however, that a particularly fine quality of oil is obtained from species of Globicephalus of which we have an Indian representative. Besides yielding ordinary "black-fish oil," these animals afford from the head a very limpid oil, commonly termed "melon oil," which has a very low solidifying point, has no corrosive effect on metal, and is a very superior lubricator for delicate machinery. Ordinary porpoise-oil is inodorous, burns with a brilliant light, congeals only in intense cold, and from its softness is valuable for lubricating and leather-dressing (*Spons' Encyclop.*). It might probably be prepared from any of the Indian species. The oil

Sperm. 74 Spermaceti. 75

obtained from Platanista gangetica is esteemed in India as a valuable embrocation in rheumatism, for strengthening the loins, and for pains in the lumbar region generally. According to Dr. Anderson it possesses high illuminating powers, and Murray mentions that it is used for burning by the fishermen of Sind. "Spermaceti" is the solid wax-like portion of Sperm-oil, or so-called "head-matter," found in the head of the Sperm-whale, Physeter macrocephalus. As already stated this, or a nearly allied species, occurs occasionally in the Indian seas. The "head-matter" is contained in a large cavity situated on the right side of the nose and upper portion of the head. By a process of purification this substance is split up into sperm-oil and spermaceti, both of which are of well known value in the arts, and the latter also in pharmacy.

Medicine.—See above description of "Oil." MEDICINE. 76

Food.—Dr. Anderson states that the Garhwals and certain other castes eat the flesh of the porpoise, Platanista gangetica, found in the FOOD. Flesh

OIL. Whale. 79 Train. 80 Blubber. 81 Whale-bone 82

undergoing a general decline (*Spons' Encyclop.*). For this reason, combined with the fact that the Indian whale is of an inferior kind, neither whale-oil nor whale-bone are ever likely to become important economic articles in this country.

(*J. Murray.*)

Wheat, see Triticum sativum, *Lamk*; pp. 88—202.

WHEELS.

Wheels, Timbers used in making—See under the following in their respective places in this work. 83

Acacia arabica, wheels.	Feronia elephantum, naves of wheels
A. Catechu, wheelwrights' work.	Hopea odorata, cart-wheels.
A. modesta, cart-wheels, persian water-wheels.	Lagerstrœmia parviflora, cart-wheels
Ægle Marmelos, naves and other parts of carts	Odina Wodier, wheel-spokes.
Albizzia Lebbek, wheel-work.	Ougeinia dalbergioides, carriage-poles and wheels.
A. odoratissima, wheels.	Pongamia glabra, cart-wheels.
A. procera, wheels.	Salvadora oleoides, persian wheels.
A. stipulata, naves of wheels and cart wheels	Streblus asper, wheels.
	Tamarindus indica, wheels.
	Tamarix articulata, persian wheels.
	...les.
Dalbergia cultrata, wheels.	Zizyphus Jujuba, *Lamk.*; persian wheels.
D. latifolia, cart-wheels.	
D. Sissoo, felloes and naves of wheels.	

White Lead, see Lead, Vol. IV., 603; also Pigments, Vol. VI., Pt. I., 231

WIGHTIA, *Wall.; Gen. Pl., II., 938.*

84 **Wightia gigantea**, *Wall.; Fl. Br. Ind., IV., 257;* SCROPHULARINEÆ.

Syn.—GURELINA SPECIOSISSIMA, *Don.*

Vern.—*Lakoú*, NEP.; *Bop*, LEPCHA.

References.—*Gamble, Man. Timb., 273; Cat. Pl., Darjiling, 58; Aplin, Rept. on Shan States, 1887-88; Ind. Forester, XIV., 343.*

Habitat.—A large tree, often half epiphytic, appressed to, and grasping the boles of forest trees by roots given off from the trunk, which are sometimes a foot or more in diameter. It is found in the Central and Western Himálaya, from Sikkim to Bhután, between the altitudes of 3,000 and 7,000 feet. Mr. Aplin recently found it also in the Southern Shan States of Burma.

TIMBER 85 Structure of the Wood.—White, porous, light, and soft; it does not warp, and is employed in the Himálaya to make Buddhist idols (*Gamble*).

WIKSTRŒMIA, *Endl.; Gen. Pl., III., 193.*

86 **Wikstrœmia canescens**, *Meissn.; Fl. Br. Ind., V., 195;* [THYMELÆACEÆ.

Syn.—W. SALICIFOLIA, *Dcne.*; W. CHAMÆDAPHNE & INAMŒNA, *Meissn.*; W. VIRGATA, *Meissn.*; DAPHNE CANESCENS & VIRGATA, *Wall.*; D. SERICEA, *Don*; D. INAMŒNA, *Gardn.*; D. OPPOSITIFOLIA, *Ham.*

Vern.—*Chamlia*, KUMAON; *Bhat niggi, thilák*, PB.

References.—*Beddome, For. Man., 178; Brandis, For. Fl., 386; Gamble, Man. Timb., 314; Stewart, Pb. Pl., 189; Atkinson, Him. Dist., 316.*

Habitat.—A small shrub, found in the Temperate Himálaya from Kumáon to Central Nepál and the Khásia Hills, between 5,000 and 6,000 feet; also in Upper Assam and the Central Province of Ceylon.

FIBRE. Bark 87 Fibre.—An inferior sort of Nepal-paper is made from the BARK in Kumáon; but it affords a strong cordage material, and ropes made of it are used in Naini Tál (*Madden*). (*Conf.* with the article on Daphne, *III.*, 20-24).

WILLUGHBEIA, *Roxb.; Gen. Pl., II., 691.*

88 **Willughbeia edulis**, *Roxb.; Fl. Br. Ind., III., 623;* APOCYNACEÆ.

MALAYA OR BORNEO RUBBER.

Syn.—W. MARTABANICA, *Wall.*; PACOUREA GUDARA, *Ham.*

Vern.—*Luti-am*, BENG.; *Thit kyouk nway*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 260; Kurz, For. Fl. Burm., II., 165; Drury, U. Pl., 445; Ind. Forester, VII., 242; Agri.-Horti. Soc. Ind., Trans., VI., 29; Journ (New Series), VII., Pt. iii., 92.*

Habitat.—A large climber, found in Assam at Goalpara, Sylhet, Cachar, Chittagong, Pegu, Martaban, and Malacca, distributed to Borneo.

GUM. 89 Gum.—It yields a form of Caoutchouc, see India-rubber, Vol. IV., 363.

FOOD. Fruit. 90 Food.—The FRUIT is eaten by Natives, and is considered good (*Roxb.*).

Wines, see Narcotics, Vol. V., 319, 338; also Vitis above, pp. 251-296.

WISSADULA, *Medik.; Gen. Pl., I., 204.*

91 **Wissadula rostrata**, *Planch; Fl. Br. Ind., I., 325;* MALVACEÆ.

Syn.—W. PERIPLOCIFOLIA, *Thwaites*; W. ZEYLANICA, *Medik.*; ABUTILON PERIPLOCIFOLIUM, *G. Don*; SIDA PERIPLOCIFOLIA, *Linn.*

References.—*Roxb, Fl Ind, Ed., C.B.C., 516, Thwaites, En Ceyl Pl, 27, Royle, Fib. Pt, 263.*
Habitat.—Cultivated in India, naturalised in Ceylon, and very common in the south of the island; a native of the Malay Peninsula, Java,

FIBRE
Bark
92

...o 5 feet in length, and display a ... d for spinning as jute, but are apparently superior" From this description the fibre would seem to resemble that of the nearly related Sida rhombifolia (*Cf. Vol. VI, Pt II, p. 681*), and, like that fibre, to be well worthy of further examination.

WITHANIA, *Pauq.; Gen. Pl., II, 893.*

[*t. 1616;* SOLANACEÆ.

Withania coagulans, *Dunal.; Fl. Br Ind, IV, 240, Wight, Ic,* 93
THE CHEESE-MAKER OF INDIAN RENNET.
Syn.—PUNEERIA COAGULANS, *Stocks.*

Hal...
and Balúchistán
Medicine.—The FRUIT, when fresh, is used as an emetic; when dried MEDICINE. Fruit. 94

... nic liver complaints. Stewart states that it has anodyne or sedative properties According to Honigberger the LEAVES are bitter, and are given as a febrifuge by the Lohanis. *Thirty-five years in the East by Honigberger, Vol. II, 325.* Leaves. 95
Domestic, etc.—The FRUIT is commonly employed in Sind, North- DOMESTIC. Fruit. 96

Dr. Stocks in the
1880-81, the questi
was represented a
cheese by Natives, ...
as an industry, attracted the attention of the authorities at Kew. Sir J.

WITHANIA coagulans.

The Cheese-maker or Indian Rennet.

DOMESTIC.

D. Hooker, on the suggestion of Surgeon-Major Aitchison, recommended the trial of the fruit of this plant. A quantity of the dried capsules were obtained at the Government Farm, Khandesh, and were found to answer wery well, the Superintendent reporting as follows:—"It has been ascertained that an ounce of the powdered capsules in a quart of water is a very suitable strength for use; a table-spoonful of this decoction coagulates a gallon of warm milk in about half an hour." Experiments made in 1883 and 1884 at the Saidapet Farm, Madras, were much less satisfactory, probably owing to the fruit having been old and inactive, or to the defective method employed. In this case the powdered fruit was added to the milk without any previous soaking; and as a natural consequence very little coagulation occurred till the milk became unfit for use (see **Streblus asper**, Vol. VI., Pt. III., 373). In November 1883, Mr. S. Lea published an account of certain experiments he had made with the seeds, with the object of ascertaining whether they contained a definite ferment with the properties of ordinary Rennet, and the applicability of such a ferment to cheese-making purposes. The seeds, carefully separated from the capsule and all other foreign matter, were subjected for 24 hours to the action of various solvents which were then added to milk. A five-per cent. solution of common salt in water was found to be most efficient in the extraction of the ferment, the extract rapidly curdling milk. The results of Mr. Lea's experiments may be summarised as follows:—

Experiments in cheese-making.
97

(1) The sodic chloride solution extract loses its activity if boiled.
(2) The ferment is soluble in glycerine, and can be extracted from the seeds by means of it; this extract possesses strong coagulating powers, even in small amounts.
(3) Alcohol precipitates the ferment body, but it may be re-dissolved in an appropriate fluid without loss of its coagulating power.
(4) The active principle will cause coagulation when present in very small amount; the addition of a larger quantity simply increases the rapidity of the coagulation.
(5) The coagulation is not due to the formation of acid by the ferment.
(6) The clot is a true clot, resembling in appearance and properties that formed by animal rennet, and is not a mere precipitate.
(7) Lastly, there is no doubt that the substance, which possesses the coagulating power, is a ferment, closely resembling animal rennet.

Having determined these points the analyst went on to endeavour to prepare an active extract which should be applicable for cheese-making purposes. The only difficulty encountered was in obtaining a colourless solution, since all the extracts proved to be deep-brown, and all methods of decolourizing them destroyed the activity of the ferment. In order to obviate this disadvantage he found it best to prepare very concentrated, active extracts of carefully cleaned seeds. Such an extract he prepared by grinding the dry seeds very fine in a mill, extracting them for 24 hours with a volume of five per cent. salt solution sufficient to render the mass still fluid after the absorption of water by the fragments of the seeds as they swelled up, and separating the fluid part of the mass by a centrifugal machine, and subsequent filtering. Forty grammes of the seeds thus treated with 150 cubic centimetres of five per cent. salt solution, gave an extract of which 0·25 cubic centimetres, clotted 20 cubic centimetres of milk in 25 minutes, and 0·1 cubic centimetres clotted a similar volume of milk in one hour, in both cases producing a perfectly white curd. But the presence of a little colouring matter may be after all unimportant and scarce-

extract.

Withania somnifera, *Dunal; Fl. Br. Ind., IV., 239; Wight, Ic., t.853.* 98
Syn.—PHYSALIS SOMNIFERA, *Link.;* P. FLEXUOSA, *Linn.*, P. ARBORESCENS & TOMENTOSA, *Thunb*

Ve

PERS.

MEDICINE. Root. 99

blance to the root of W. somnifera. The *asgund* of the shops is the tuber of a CONVOLVULUS, which, though much smaller and different in

MEDICINE. habit, does not appear to differ botanically from Ipomæa digitata" (*Cf.* Vol. IV., 484). Honigberger was, however, the first author who pointed out the mistake in the two roots commonly sold as *asgund*. The Panjabís, he says, call the plant *agsend*, not as stated by some authors *asgend*, the latter is also officinal in the Panjáb, but is imported from Hindústán. Roxburgh states that the "Telinga physicians reckon the roots alexepharmic." Ainslie describes the bazár *asgund*, which is probably not the article

Leaves. 100 at present under consideration, and states that the LEAVES (very likely those of Withania), moistened with a little warm castor-oil, are a useful

Seeds. 101 external application in cases of carbuncle Irvine describes the SEEDS as diuretic and hypnotic, and the ROOT as narcotic and diuretic, a remark

Root. 102 confirmed by Dalzell & Gibson. In the *Pharmacopœia of India*, the root is said to be used externally similarly to the leaves, to be regarded by Rájpúts as useful in rheumatism and dyspepsia, and to be feebly diuretic. Most of the above information probably refers in reality to this species.

The *asgund* of the shops is quite different in appearance from the root of Withania (see Vol. IV., 484); it has a mucilaginous and slightly bitter taste, and is evidently the *asvagandha* of Sanskrit writers. According to Dutt it is regarded in Hindu medicine as tonic, alterative, and aphrodisiac, and is employed in consumption, emaciation, debility from old age, and rheumatism. It enters into the composition of many tonic preparations prescribed by Chakradatta and others, and is a favourite constituent of aphrodisiac medicines (*Mat. Med. Hindus*). Dymock informs us that in the *Makhsan-el-Adwiya* it is described as tonic and alterative, and is said to have much the same properties as white Behen.

SPECIAL OPINION.—§ "Root, tonic and diuretic, juice of whole plant a useful remedy for rheumatism, in doses of one to two ounces: no narcotic effect observed" (*Apothecary T. Ward, Madnapalle, Cuddapah*).

FODDER. Leaves. 103 Fodder.—In the Panjáb, the LEAVES are browsed by goats.

DOMESTIC. Seeds. 104 Domestic, etc.—In Bombay the SEEDS are employed similarly to those of W. coagulans in Sind, *viz.*, to coagulate milk (*Dalz. & Gibs.*). Stewart

Root. 105 states that the ROOT is occasionally employed in the Panjáb to effect criminal abortion, and that the same practice is believed to be common in Sind.

Wood-apple Tree, see Feronia elephantum, *Corr.*; Vol. III., 324.

Wood-oil, see Dipterocarpus alatus, *Roxb.*; D. incanus, *Roxb.*; D. lævis, *Ham.*; D. pilosus, *Roxb.*; D. tuberculatus, *Roxb.*, & D. turbinatus, *Gærtn. f.*; Vol. III., 157-171.

WOODFORDIA, *Salisb.*; *Gen. Pl.*, *I.*, 778.

106 **Woodfordia floribunda**, *Salisb.*; *Fl. Br. Ind.*, *II.*, 572; LYTHRACEÆ.

Syn.—W. TOMENTOSA, *Bedd.*; W. FRUTICOSA, *Kurz*; GRISLEA TOMENTOSA, *Roxb.*; G. PUNCTATA, *Ham.*; LYTHRUM FRUTICOSUM, *Linn.*

Vern.—*Dáwi, thawi, santha, dhaula, dhaura, dhái, dha*, HIND.; *Dhái, dhaura-dawai, dhawayi, dawa, dhowa, dhao, dhadki, dhau, dhainti, dhager-* BENG.; *Icha, dhawe*, KOL; *Ichak*, SANTAL; *Dahiri, laldairo, dhagerako*, NEPAL; *Chungkyek-dúm*, LEPCHA; *Jatiko, harwari*, URIYA; *Dadki*, BHUMIJ; *Khinni, dhi*, KURKU; *Dhuvi, surtári, dhaiti, dhowra, dhowai*, C. P.; *Pitza, petisurali, surteyli*, GOND.; *Datti*, BHIL; *Dhai*, N.-W. P.; *Dhewti*, OUDH; *Dhái, dhaula, dhaura, thawa, dhárla*, KUMAON; *Gul daur, dhai*, KANGRA; *Tháwi, thái*, KASHMIR; *Táwi, thái, tau, dahái, dháwi, khúrd, dhá, dáwi, dhaur, dhas*, flowers = *gul-dháwi, gul bahar*, PB.; *Dátki*, PUSHTU; *Dhái*, SIND; *Dhauri, dhayati, dhávri, dhavshi*, BOMB.; *Phulsatti, dhasatichi*, MAR.; *Dhavadina*, GUZ.; *Jar-*

mamu, reyyi pap-

... ıı, For. Fl, 238, ... ıal Gen., t XIV., ... ; Dals & Gibs, ... Rept Econ. Pl, ... , Sir U C ... 144, ... ooper, ... , No. ... U ... 53, 778, ... N-W ... P W ... sins, ... , Dye ... Selec- ... dras ... Settlement Reports—Central Provinces, Chanda, App. vi, Raepore, 76, 77, Hoshungabad, 180, Gazetteers—Bombay, ... XV., 434, Panjab, IV., lxrıı, Burma, ... s), I, 290-292, IX., ... I., Sel, 19, Trans. ... ; Ind. Forester, II, ... , 14; XIII., 121, ... 290, 390.

Habitat.—A small, much-branched shrub, brilliantly purple in the hot season owing to the numerous flowers all along its branches; common throughout India, ascending on the Himálaya to an altitude of 5,000 feet, and in the mixed dry forests of Prome.

Gum.—According to Balfour the gum of this plant known as *dhaura* or *dhau-ka-gond* is collected largely in Harauti and Mewar. It is said to resemble gum tragacanth and to swell in water. It is employed in dyeing to coat the parts of a fabric which are required to remain uncoloured; one maund is said to cost R10. GUM. 107

Little is known about the properties or value of this gum. Cooke writes: "The Museum samples do not at all agree in ... e sample from Allahabad is ... n Bengal is in smaller fragme... ... ocarpus. The ... size of a filbert, ... at there is some ... or *dhau*, etc.— ... The writer has ... Woodfordia.—

... ng either ... ant, prin- ... nt flowers ... gathered and dried, and in districts where the LEAVES are used as a tan, these are gathered and dried in the autumn. The plant is everywhere a jungle pro- DYE Flowers. 108 Leaves. 109

... prepared, alum, or lime and alum, is added

DYE. as a mordant, and the material to be dyed is immersed in this solution several times until a pink colour of the required depth is obtained (*Dyes & Tans of Bengal*). In the Central Provinces and Rájputána and the Panjáb, the practice of dyeing with the flowers alone appears to be more common than elsewhere; a pink or red colour is said to be obtained. Sir E. C. Buck (*Dyes of N.-W. Prov.*, p. 37) makes no mention of their being used except in *ál* dyeing or with silk.

Samples of the flowers submitted for examination to Mr. Wardle elicited the following report:—"These flowers, a sample of which, in the dried state, I have examined with regard to their tanning and dyeing qualities, I find are principally valuable from the fact that they contain tannin equivalent to about 25 per cent. of oak-bark tannin, thus being almost equal to sumach. They contain also a small amount of yellowish-brown colouring matter soluble in water, which gives, by the use of various processes, faint though artistic shades of colour to *tussur* silk, mulberry silk, and woollen fabrics, and when the infusion is simply applied without the intervention of any other mordant, no doubt the tannin acts as a fixing agent. When the infusion is used as a dye in the presence of a salt of iron, peculiar slate and brownish shades may be obtained, owing to the dark colour produced by the action of the iron on the tannin being modified by the yellow colouring matter contained in the flowers." Sir E. C. Buck (p. 53) alludes to this fact being known to the calico-printers of India, as giving lustre to the black dyes of sulphate of iron. In another passage Mr. Wardle describes the tints produced on silk as "beautiful brown-yellow colours."

Twigs. 110 The leaves and TWIGS yield a yellow dye called *nauti*, which is occasionally used in Northern India in calico printing (*Sir E. C. Buck*).

TAN. Flowers. 111 Leaves. 112 **Tan.**—Though the flowers would appear from Mr. Wardle's report to be of considerable value as a dye-stuff, still, as he remarks, their importance depends much more on the large quantity of tannin they contain. They have been long used to a small extent for tanning in certain parts of India, but appear to have been neglected for this purpose, for the LEAVES, which are one of the most commonly employed of Indian tanning materials. Perhaps the first person to notice the large amount of tannin contained in the flowers was Dr. Balfour, who thus explained their value in *ál* dyeing. As stated above Mr. Wardle found them to contain a large percentage, and predicted the probable value which they might thus obtain. At the Colonial and Indian Exhibition samples were submitted for analysis to Professor J. J. Hummel. He reported that they contained 20·6 per cent. of tannic acid, and yielded a deep red turbid solution. He classed them with the best Indian tanning materials, and remarked, "On examining the list (of selected tanning materials) it becomes evident that the best Indian tannin matters are already in the market, with the exception of Woodfordia floribunda; and even this has the disadvantage of giving deeply-coloured decoctions." "I was somewhat surprised to find the flowers contain such a large percentage of tannic acid; but it explains why the Hindus use these flowers in connection with alum as a mordant and with other dye-stuffs, *e.g.*, Morinda, as mentioned in the Exhibition Catalogue. It would be interesting to examine the leaves of the plant."

It is to be hoped that the last suggestion may be carried out. The leaves may prove of equal value and could probably be obtained in larger quantities and more cheaply. Professor Hummel estimated the value of the flowers at 5*s.* 7*d.* as compared with Divi-divi, 10*s.* 5*d.* as compared with Valonia cups, 14*s.* as compared with Ground Sumach, and 6*s.* 8½*d.* as compared with Ground Myrabolans. Regarding the available supply and cost in India, accounts vary greatly, and reliable information is .n

many cases wanting. In Bengal McCann states that no particulars are available except from Palamau
is estimated at 200 maunds. In
obtainable in January and Febr. TAN.

ual export from the tract be-
27 tons, of which about 200
vision Sir E. C. Buck states
nto the North-
From these
d be obtained
r maund

Medicine.—The dried FLOWERS are regarded in Hindu medicine as MEDICINE. Flowers 113

cases of bilious sickness, fill the patient's mouth with sesamum oil, and apply the JUICE of the LEAVES to the crown of the head; this is said to cause the oil in the mouth to become yellow from absorption of bile; fresh oil is then given repeatedly until it ceases to turn yellow In Northern Juice. 114 Leaves. 115
g, astringent, and stimulant, and
nd mucous disorders, and hæmor-
medicinally in Native practice
e flowers is given for the female
).

FOOD. Flowers. 116

TIMBER. 117

Wool, see the article Sheep and Goats, Vol. VI., Pt. II., 549—672.

WORMIA, *Rottb.; Gen. Pl., I., 13 & 954.*

Wormia triquetra, *Rottb.; Fl. Br. Ind, I, 35;* DILLENIACEÆ. 118

Syn.—W. DENTATA, *DC.;* DILLENIA DENTATA, *Thunb*

Vern.—*Diyapara*, SING.

References —*Thwaites, En. Ceyl. Pl, 4; Gamble, Man. Timb., 4.*

Habitat.—A tree found in the moist, warm parts of Ceylon up to 2,000 feet.

Oil.—The NUT yields an oil (*Gamble*). OIL. Nut. 119

Structure of the Wood.—Reddish, resembling that of Dillenia; weight 44lb per cubic foot. It is used in building. TIMBER. 120

Worm-seed, see Artemisia maritima, *Linn.;* Vol. I., 324.

Worm-wood, see Artemesia Absinthium, *Linn.;* Vol. I, 323.

WRIGHTIA, *Br.; Gen. Pl., II., 712.*

Wrightia antidysenterica, *Grah.;* APOCYNACEÆ; see Holarrhena antidysenterica, *Wall.;* Vol. IV., 255. 121

122 **Wrightia tinctoria**, *R. Br.; Fl. Br. Ind., III., 653; Wight, Ic., t. 444.*

Syn.—NERIUM TINCTORIUM, *Roxb.*

Var. Rothii=W. ROTHII, *G. Don; Wight, Ic., t. 1319;* W. TINCTORIA, *Roth.*

Vern.—*Indarjou, mithá indarjou,* HIND.; *Indrajau, indarjou,* BENG.; *Khirni,* MEYWAR; *Dudhi,* BANDA; *Kálakado, kála-kudi, kuda, khirni, bhárkúri, kála-kúra,* BOMB.; *Kála kúdú, indrajou,* MAR.; *Indarjou,* GUZ.; *Indarjou, mithá indarjou,* DEC.; *Pálá, veypalé, pilá, palak, palavay-ravnú, vetpá-larishi, vetpála,* TAM.; *Tedlupál, tella pal, amkudu, tellapála, tshil-ankalú, chit-ankalú, kodisha, kalinga,* TEL.; *Kodmurki, betpa'li, hale,* KAN.; *Kotakappála,* MALAY.; *Veppál-arsi, vepápál,* SING.; *Hyamaraka,* SANS.; *Lasánul aasafir, lasánul-aasáfirulhaló,* ARAB.; *Indarjou, indarjouve-shirin, ahar, ahare-shirin, zabánekunj i hk, zabáne-kunjashke-shirin,* PERS.

Two kinds of *indarjau* are found in the bazárs and have been much confused, namely, the seeds of this species—sweet *indarjau*—and those of Holarrhena antidysenterica,—bitter *indarjau* (see Vol. IV., 255).

References.—*Roxb., Fl. Ind., Ed. C.B.C., 243; Brandis, For. Fl., 324; Kurz, For. Fl. Burm., II., 193; Beddome, Fl. Sylv., t. 241; Gamble, Man. Timb., 264; Grah., Cat. Bomb. Pl., 114; Dalz. & Gibs. Bomb. Fl., 145; Elliot, Fl. Andhr., 14, 44, 174; O'Shaughnessy, Beng. Dispens., 446; Moodeen Sheriff, Supp. Pharm. Ind., 259; Dymock, Mat. Med. W. Ind., 2nd Ed., 500; Baden Powell, Pb. Pr., 601; Drury, U. Pl., 447; Lisboa, U. Pl., Bomb., 100, 166, 247, 291, 391; Birdwood, Bomb. Pr., 55, 301; Buck, Dyes & Tans, N.-W. P., 30; Liotard, Dyes, 96; Man. Adm. Madras, II., 98; Moore, Man. Trichinopoly, 81; Nicholson, Man. Coimbatore, 41; Gazetteers:—Mysore & Coorg, I., 62; Bombay, VI., 14; XIII., 25; XV., 79, 438; Agri.-Horti. Soc. Ind., Journ. (Old Series), III., 232; IV., Sel., 86-88, 129, 130; Pro., 27, 36, 91; V., 7, Sel., 28, 30, 77; IX., 296, Sel., 55; XI., Pro., 52; Ind. Forester, III., 203; VI., 240; XII., App., 16.*

Habitat.—A small deciduous tree met with in Central India, the Western Peninsula generally, and Burma.

Dye.—The SEEDS are said to be used as an adjunct to other materials in dyeing. From time immemorial the Natives of Southern India have employed the LEAVES as a source of a blue dye or indigo. This fact appears to have first attracted the notice of Roxburgh, who wrote a treatise on the subject, recommended certain apparatus, boilers, etc., to be used in the preparation of the dye, and in 1792 made and transmitted a sample to England. He found that the colouring matter was contained in the leaves alone; that the best time for gathering was in March and April, but that the picking might be profitably continued till the end of August; that the colouring matter might be completely extracted by boiling for three hours, and that from two to three hundred pounds of the leaves yielded one pound of indigo. After the date of Roxburgh's experiments and treatise interest in the matter appears to have dropped till 1844. In that year the subject was again raised in the publications of the Agri.-Horticultural Society of India, and much interesting information was elicited. From papers by a Mr. Fischer of Salem in particular, it appears that the manufacture of Wrightia indigo had been carried on for some years in that place, with an apparatus fundamentally similar to that proposed by Roxburgh. The indigo obtained was good, and fetched from 4 to 5-6*d.* per lb. The leaves picked by coolies in the jungle cost from 3 to 4 annas per 150 to 200lb, from which quantity one pound of dye was obtained. The leaf was mixed with water, boiled in large boilers and the dye separated in a straining vat.

DYE. Seeds. 123 Leaves. 124

The objections to the further utilisation of the leaves of this common tree in competition with ordinary indigo appear to have been, *1st*, the great

expense of the boilers and the fuel required for them; 2nd, the limited quantity of leaves obtainable at any one place and the large area over which they have to be collected

These facts must necessarily render the preparation of Wrightia indigo more expensive than that obtained from Indigofera (Cf. Indigo, Vol IV., 451) DYE

Medicine.—The ROOT-BARK of this plant, along with the SEEDS, have been the cause of much confusion in the literature of Indian Materia Medica This has already been fully dealt with under the article Holarrhena antidysenterica (see Vol IV., 255-258), and need not be again entered into here The plant now under consideration is practically inert from a medicinal point of view. MEDICINE. Root-bark. 125 Seeds. 126

Food.—According to Lisboa the tender LEAVES and PODS are eaten in Bombay. FOOD Leaves 127 Pods 128

Structure of the Wood.—White like ivory, hard, close-grained, weight 49lb per cubic foot. It is used for carving, turnery, and building. TIMBER. 129

Domestic & Sacred.—The tree bears handsome clusters of white, jasmine-scented FLOWERS, which are much esteemed by Hindus as fit offerings at temples. DOMESTIC. & SACRED Flowers 130

Wrightia tomentosa, *Ræm. & Schultes*; *Fl. Br. Ind*, *III.*, 653; [*Wight, Ic*, *t.* 443, 1296 131

Syn.—W. MOLLISSIMA, *Wall.*, W WALLICHII, *A DC.*, W. CORAIA, *Wall*; W. HAMILTONIANA, *Wall.*, HUNTERIA EUGENIFOLIA, *Wall*, NERIUM TOMENTOSUM, *Roxb.*, N CORAIA, *Ham*, N. ? TINCTORIUM, *Ham.*

Vern.—*Dudhi, dharauli, daira*, HIND., *Dudh-koraiya*, BENG, *Sandikuya*, KOL, *Atkura, buru machkunda*, SANTAL, *Atkuri*, ASSAM, *Karingi, kirra*, NEPAL; *Selemnyok*, LEPCHA; *Pal kurwan*, URIYA, *Harido*, CUTTACK; *Dúdhi, kildwa, keor*, PB; *Dudhi, kadu-inderjao, daira*, BOMB.; *Kala inderjan*, MAR., *Tella pal, koila-mukri, koylia mokiri, pútta jillédu, pedda pála*, TEL; *Lettouk thein, lettop-thein*, BURM.

References.—*Roxb*, *Fl Ind.*, *Ed C B C.*, 243, *Brandis*, *For Fl*, 323, *Kurz*, *For. Fl Burm*, *II*, 192, 193, *Beddome*, *Fl. Sylv*, *Anal Gen*, 159, *Gamble*, *Man. Timb*, 264, *Grah*, *Cat Bomb Pl.*, 114, *Dalz & Gibs*, *Bomb. Fl*, 145; *Stewart*, *Pb. Pl*, 143, *Mason*, *Burma & Its People*, 398, 799, *Elliot*, *Fl Andhr*, 100, 149, 160, 161, *Campbell*, *Econ Prod*, *Chutia Nagpur*, *Nos* 9221, 9284, *Atkinson*, *Him Dist*, 313, *Lisboa*, *U. Pl Bomb*, 100, 248, 274, 391, *Darrah*, *Note on Cotton in Assam*, 34; *For Adm Rep*, *Chutia Nagpur*, 32, *Agri.-Horti Soc Ind*, *Journ.* (*Old Series*), *XIII*, 319, *Gazetteers*.—*Bom bay*, *XIII*, 24, *N W. P.*, *IV.*, *lxxiv.*

Habitat.—A small deciduous tree with corky bark, found throughout Tropical India from the Indus eastwards and southwards to Ceylon, Burma, and Penang, ascending to 2,000 feet in the Himálaya and to 4,000 in the Nilghiris.

Dye.—Every part of the tree discharges a yellow, milky JUICE on being wounded. Roxburgh states that this yields a fairly good yellow dye when diluted with water, and that pieces of cotton so coloured retained their colour unimpaired for two years. Its value for this purpose is apparently not known to Natives, nor has it been commented on by writers subsequent to Roxburgh. DYE Juice 132

Medicine.—A thick red-coloured medicinal OIL is said to be obtained from the SEEDS, but this is probably a mistake. The seeds of Holarrhena antidysenterica, with which this might easily be confused, certainly yield a medicinal oil. In Chutia Nagpur a preparation from the BARK is given in menstrual and renal complaints (*Campbell*). The BARK and ROOT-BARK are said by Lisboa, Gamble, and others to be believed useful in snake-bite and scorpion stings, probably again a mistake which has MEDICINE. Oil. 133 Seeds. 134 Bark. 135 Root Bark. 136

arisen from the confusion between the species of this genus and Holarrhena.

FOOD. Leaves. 137 Food.—The LEAVES are eaten as a pot-herb by the Santals (*Campbell*).

TIMBER. 138 Structure of the Wood.—Yellowish-white, moderately hard, close-grained; weight 41·5lb per cubic foot (*Gamble*). It is even-grained, easy to work, and used for making combs, and for carving and turnery.

139 **Wrightia zeylanica**, *Br.; Fl. Br. Ind., IV., 654.*

Syn.—W. ANTIDYSENTERICA, *Br.;* NERIUM ZEYLANICUM & N. ANTIDYSENTERICUM, *Linn.;* N. DIVARICATUM, *Herb. Madr.*

Habitat.—A common tree in the south of Ceylon, which, like the other species of this genus, has been much confused with Holarrhena antidysenterica [see Vol. IV., 255-258], but which is itself inert and valueless.

XANTHIUM, *Linn.; Gen. Pl., II., 355.*

1 **Xanthium strumarium**, *Linn.; Fl. Br. Ind., III., 303;* COMPOSITÆ.

BUR-WEED; LAMPOURD, *Fr.;* SPITZKLETTE, *Ger.*

Syn.—X. INDICUM, *DC.;* X. ROXBURGHII, DISCOLOR, & BREVIROSTRE, *Wallroth;* X. ORIENTALE, *Blume.*

Vern.—*Ban-okra, chhota-gokhrú,* HIND.; *Ban-okra,* BENG.; *Agara,* ASSAM; *Tsúr, láne tsúrá,* KASHMIR; *Wangan tsúrá, chirrú, kúri, jojre, súngtú, gúdal, gokru?, khagarzal?,* fruit=*gokhrú kalán,* PB.; *Bagiári,* PUSHTU; *Gókhrú kallán,* SIND; *Shankeshvara,* BOMB.; *Dutundi,* MAR.; *Marlumutta,* TAM.; *Verri tala noppi, pársvapu, tala noppi, talnopi, marula mátangi, marulu jada, marulu tige,* TEL.; *Cho-sa, kouk-pin,* BURM.; *Arishta,* SANS.

References.—*Roxb., Fl. Ind., Ed. C.B.C.,* 660; *Dalz. & Gibs., Bomb. Fl.,* 127; *Stewart, Pb. Pl.,* 132; *Elliot, Fl. Andhr.,* 113, 145, 172, 191, *Dymock, Mat. Med. W. Ind., 2nd Ed.,* 458; *Murray, Pl. & Drugs, Sind,* 182; *Note on the Condition of the People of Assam, App. D; Gazetteers:—Mysore & Coorg, I.,* 62; *N.-W. P., I.,* 81; *IV.,* lxxiii.; *Journ. (Old Series), Agri.-Horti. Soc. Ind., X.,* 11.

Habitat.—A coarse annual herb, found throughout the hotter parts of India and Ceylon, usually near houses; it ascends the Western Himálaya to 5,000 feet.

DYE. Leaves. 2 Dye.—According to Balfour the LEAVES are used as a yellow dye.

OIL. Seeds. 3 Oil.—The SEEDS are said to yield an oil used in medicine, also for illumination.

MEDICINE. Fruit. 4 Medicine.—The FRUIT is employed medicinally in the Panjáb and Sind, being considered cooling, and efficacious in small-pox. The latter belief is due to the appearance of the fruit, from which it is used on the doctrine of signatures. In certain parts of the same provinces it is burnt and applied to sores on the lips and mucous membrane of the mouth. In Southern India the prickly INVOLUCRE is applied to the ear, or tied in a bunch to the ear-ring, to cure hemicrania (*Elliot*).

Chemistry. 5 CHEMICAL COMPOSITION.—"Zander (1881) obtained from 100 parts of the fruit, 52 ash, 38.6 fat, 36.6 albumenoids, 1.3 *Xanthostrumarin* and organic acids, besides sugar, resin, etc. *Xanthostrumarin* seems to be a glucoside, is yellow, amorphous, soluble in water, alcohol, ether, benzol, and chloroform, and yields precipitates with group reagents for alkaloids, and with ferric chloride, lead acetate, and salts of other metals, but is not precipitated by tannin or gelatin. M V. Cheatham (1884) obtained only 14.5 per cent. of fixed oil, and a principle which was precipitated by tannin" (*Dymock, quoting Amer. Journ. Pharm.,* 1881, 271, & 1884, 134).

SPECIAL OPINIONS.—§ "Known here as *Bhukhra* Has proved very useful in urinary diseases, a good diuretic, diminishes the irritability of the

bladder. Very useful also in gleet and leucorrhœa, given as infusion (℥ii to ℥v of water) or in one-drachm doses in powder. Extensively used in Panjáb. Has also been given in menorrhagia" (*Civil Surgeon J. C. Penny, M B, Amritsar*). "Hospital Assistant Gopal Chunder Ganguli states that the fruits are slightly narcotic" (*Surgeon A C. Mukerji, Noakhally*). MEDICINE.

FOOD. Flowering-top. 6

requires explanation, from the fact that the plant has been found in America and Australia to be poisonous to cattle and pigs. It is said to paralyse the heart causing coma and death without pain or struggle. Leaves. 7

Xanthochymus pictorius, *Roxb.*; see Garcinia Xanthochymus, *Hook. f.*, Vol. III., 478.

XANTHOPHYLLUM, *Roxb.; Gen Pl., I., 139, 974.* [POLYGALEÆ

Xanthophyllum flavescens, *Roxb.; Fl. Br. Ind., I., 209;* 8

Hal ... and Ceylon.

Structure of the Wood.—Heavy, close-grained, "useful to the Natives for many purposes" (*Roxb.*). TIMBER. 9

X. glaucum, *Wall.; Fl Br. Ind., I., 209.* 10

TIMBER. 11

Xanthoxylon, see Zanthoxylum, *Linn.*, below, p. 323.

XIMENIA, *Linn.; Gen. Pl., I., 346.*

Ximenia americana, *Willd.; Fl. Br. Ind., I., 574;* OLACINEÆ. 12

FALSE SANDAL WOOD.

Syn.—X. RUSSELLIANA, *Wall.*

Vern.—*Konda nakkera, úranechra*, TEL.; *Pinlaytsi, penlay-hsi, pinléat*,

Kurz, For. Fl Burm., ...rma & Its People, 751, ...; Lisboa, U. Pl. Bomb, III, 238; Agri.-Horti.

... found in the Eastern and Western Peninsulas, the Andaman Islands, Burma, Malacca, and Ceylon

Food.—Produces, about the beginning of the hot weather, small, dull white, fragrant flowers, with an odour of cloves. These are followed by small oval red or yellow pulpy FRUITS, an inch long, of an acid-sweet, aro FOOD. Fruit. 13

FOOD. Kernels. 14 matic, slightly bitter taste. When ripe the fruit is eaten by the Natives. The KERNELS are also eaten and taste much like filberts (*Roxb.*).

TIMBER. 15 Structure of the Wood.—Yellow, like sandal-wood, often powdered and substituted for true sandal-wood by the Brahmans of the Coromandel Coast in their religious ceremonies (*Roxb.*).

XYLIA, *Benth.; Gen. Pl., I., 594.*

16 **Xylia dolabriformis**, *Benth.; Fl. Br. Ind., II., 286;* LEGUMINOSÆ.

THE IRON-WOOD TREE OF PEGU and ARRACAN.

Syn.—MIMOSA XYLOCARPA, *Roxb.;* INGA XYLOCARPA, *DC.;* I. LIGNOSA, & DOLABRIFORMIS, *Grah.*

Vern.—*Jambu*, HIND.; *Boja, kongora*, URIYA; *Jamba, yerrul, suria*, BOMB.; *Jámba, jámbha, suria*, MAR.; *Irúl*, TAM.; *Konda tangédu, tanjédu, tanjedu mánu, eruvalu, bójeh, bója*, TEL.; *Jabmé, tirawa, shiive*, KAN; *Pyinkado*, BURM.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 417; Brandis, For. Fl., 171; Kurz, For. Fl. Burm., I., 419; Beddome, Fl. Sylv., t., 186; Gamble, Man. Timb., 148; Dalz. & Gibs., Bomb. Fl., 85; Mason, Burma & Its People, 530, 772; Elliot, Fl. Andhr., 29, 97; Balfour, Trees of S. India, (Madras, 1862), 133; Lisboa, U. Pl. Bomb., 65; Cooke, Oils and Oilseeds, 82; Aplin Rep. on Shan States, 1887-88; Gazetteers:—Mysore & Coorg, I., 48; II., 64; Bombay, XV., 33, 79; Burma, I., 125, 436; Agri.-Horti. Soc. Ind., Journ. (Old Series), IX., Sel., 46; XI., 446; Ind. Forester:—I., 115; II., 19; III., 23, 189; IV., 240,292, 366; VI., 125; VII., 196; VIII., 403, 414, 415; IX., 14, 216; X., 38, 543, 544, 545; XI., 231, 321, 322, 374; XII., 72, xxii., 311, 313; XIII., 127, 133, 553.*

Habitat.—A large, deciduous tree, met with in the Central Provinces, South India, Arrakan, and Burma.

RESIN. 17 Resin.—It yields a red resin, which is said to be more abundant in Burmese than in South Indian wood. It is reported that the lac insect in Southern India is found on this tree (*Bomb. Gaz., XV., i., 79*).

OIL. Seeds. 18 Oil.—The SEEDS yield an oil of which nothing is known.

TIMBER. 19 Structure of the Wood.—Sapwood small; heartwood dark-brown or reddish-brown, extremely hard, beautifully mottled, cross-grained; weight from 60 to 80lb per cubic foot. The heartwood is very durable, and resists the attacks of white ants—a property it doubtless owes in great measure to the resinous substance which it contains.

DOMESTIC. 20 Domestic.—It is used for boat-building and for agricultural implements in Burma; also for carts and tool handles. In South India, it is employed for making railway sleepers, posts, boats, and carts. In Burma and Bengal it has been largely employed for telegraph posts, for which it has answered well. The large forests in Arrakan, of which Dr. Schlich, in his report on the iron-wood forests of Arrakan, dated 1st September 1869, says that "a third of the forest vegetation consists of *Pynkado*" produce large numbers of telegraph poles and railway sleepers. Major Seaton, in his report for 1876-77, stated that 10,000 such sleepers from Arrakan had then lately been sold at Calcutta at R5 each, and Mr. Ribbentrop states that large numbers of *Pynkado* pieces and sleepers are brought out from the forests in Pegu. Between 1865 and 1868 inclusive, 70,377 sleepers were obtained by the East Indian Railway Company from Arrakan (*Burm. Gaz.*). In the *British Burma For. Adm. Rept.* for 1884-85, 17,631 are said to have been sold in Calcutta at R2-1 each. The cost of cutting and freight are said to have amounted to about 12 annas per sleeper. In 1885-86, 81,569 sleepers were removed from Burma by Government agency, of which 75,000 went to Madras and the remainder to Calcutta. The profit which accrued from the sleeper works in the Pegu circle amounted to 36 per cent. (*For. Ad. Rep., 1885-86*). The wood is hard, heavy, and difficult to cut, but is valuable for

all ordinary purposes, and is a useful wood for piles and beams of bridges (*Gamble*). Balfour, writing in 1862, states that the wood was then largely used in the Madras gun-carriage factory for poles, axle-cases, and braces for transport limbers, poles and yokes for water-carts, and cheeks and axle cases for lighter mortar carts Captain Puckle, writing at the same time from Mysore, says that it is largely employed for furniture, shafts, plough-heads, knees, and crooked timber for ship building, and for railway sleepers. The hardness of this timber has recently been utilised by Mr. Oliver, Conservator of Forests, Burma, as a new form of boundary board. These he makes of this wood, pointed at one end, so that from their hardness they can be driven on to trees of softer wood.

Xylocarpus Granatum, *Kæn.*, see Carapa moluccensis, *Lam*, Vol II., 141

XYLOSMA, *Forster*; *Gen. Pl*, *I.*, *128*.

Xylosma longifolium, *Clos.*; *Fl. Br. Ind.*, *I.*, *194*, BIXINEÆ 21

Syn.—FLACOURTIA FEROX, *Wall.*

Vern—*Dandál, katari, kandhara*, HIND, *Kattáwa*, OUDH, *Chopra, chiundi, chiránda, chirndi, chiraunda, drendú, thakola, kathugli*, PB

References.—*Voigt, Hort. Sub Cal*, *84*, *Brandis, For Fl*, *19*, *Gamble, Man. Timb*, *18*, *Stewart, Pb Pl*, *191*, *Atkinson, Him Dist*, *305*, *Gazetteer*—*N.-W. P*, *IV. lxxiii.*, *Agri-Horti Soc Ind*, *Trans*, *VII*, *73*

Habitat.—A small evergreen tree of the North-West Himálaya, from Kumáon to Marí, ascending to 5,000 feet; also found in Assam.

Structure of the Wood—Pinkish, moderately hard, even-grained, weight 55lb per cubic foot. It is used for fuel and charcoal. TIMBER. 22

XYRIS, *Linn.*, *Gen. Pl.*, *III.*, *842*

Xyris indica, *Linn.*, *Fl Br. Ind.*, *VI*, *364*; XYRIDEÆ. 23

Vern—*Dábi-dúba*, HIND; *China ghausa, chine ghas, dabidúbi*, BENG, *Dadumari*, SANS.

References.—*Roxb*, *Fl. Ind*, *Ed.*, *C.B.C.*, *60*, *Rheede, Hort. Mal IX*, *139*, *t. 7*, *Mason, Burma & Its People*, *435*, *820*, *Dals. & Gibs.*, *Bomb Fl.*, *259*, *Dymock, Mat Med. W. Ind*, *2nd Ed*, *818*

Habitat.—Found in Bengal, the Southern Konkan, and Coromandel, generally on sandy soils or salt marshes.

Medicine.—"The Natives of Bengal esteem it a plant of great value, because they think it an easy, speedy, and certain cure for the troublesome eruption called ringworm" (*Hon'ble John Hyde in a letter to Roxburgh*). This remark accords with the description of the plant as given by Rheede. MEDICINE. 24

Yak, see Oxen, Vol. V., 664.

Yamamai, see Silk.

Yamani or **Moka Aloes**, see Aloe succotrina, *Lam.*; and A. Perryi, [*Baker*; LILIACEÆ, Vol. I., 184.

Yeast, see Cerevisiæ Fermentum, or Torula cerevisiæ, Vol II, 257; also [Malt Liquors, Vol. V, 131

Yellow, Indian—, see Peori, Vol. VI, Pt I., 132.

Yew, see Taxus baccata, *Linn.*, Vol. VI., Pt. III.

YUCCA, *Linn.*; *Gen. Pl.*, *III.*, *778*.

Yucca gloriosa, *Linn.*; *Baker, in Linn. Soc. Jour.*, *XVIII.*, *225*; [LILIACEÆ. 1

ADAM'S NEEDLE.

Mr. Baker describes ten varieties, but these are not of sufficient economic importance to necessitate their enumeration in this work.

References.—*Lisboa, U. Pl. Bomb., 236; Baden Powell, Pb. Pr., 518; Royle, Fib. Pl., 57; Liotard, Mem. Paper-making Mat., 5, 15, 18; Tropical Agriculturist, 1st Feb., 1883; Smith, Econ. Dict., 5; Watt, Sel. from Rec., Govt. of Ind., R & A. Dept., 1889, 179; Spons, Cyclop., 999; Gazetteers:—Mysore & Coorg, I., 67; N.-W. P., I., 85; Ind. Forester, IX., 274; Agri.-Horti. Soc. Ind., Journ. (Old Series), II., Sel., 458; IX., 114, 120.*

Habitat.—A native of America from Northern Carolina to Florida (*Baker*); introduced into India as a cultivated plant of gardens, naturalised here and there in the Madras Presidency, and on the lower slopes of the Himálay, often seen in hedges.

FIBRE. Leaves. 2 Fibre.—This species, together with the less important **Y. angustifolia**, *Pursh.*, and **Y. filamentosa**, *Linn.* (the Silk or Bear Grass), contains a large quantity of fibre in the LEAVES, which is in many respects similar to that of Agave and is applicable to like purposes. It is from 2 to 4 feet in length, rather wiry, fine, round, even, strong, and easily dyed. It is moderately flexible, but has naturally a certain amount of harshness. The fibre has apparently not attracted the attention it deserves, even in America where it occurs plentifully. Thus the writer of the article on the subject in *Spons' Encyclopædia* remarks, "The whole genus has been utterly neglected from an industrial point of view, no real attempt having ever been made to grow the plants on a commercial scale, though their hardiness, their preference for arid, barren sands, and the quality of their fibre would seem to be special recommendations." The fibre, if obtainable at a sufficiently low price, would doubtless be specially suited to many of the requirements of the paper-maker.

MEDICINE. Fruit. 3 Root. 4 Soap-substitute. 5 Medicine.—The FRUIT is purgative, the ROOT detergent (*La Maout & Decaisne*). **Dr. Bidie** writes that the latter statement is not correct as regards the root of **Y. gloriosa** in India. [The Indian public papers were recently greatly concerned in an announcement of supposed considerable importance regarding a plant the leaves of which yield fibre and the roots a useful soap-substitute. It seems likely that the plant referred to may have been a Yucca.—*Ed., Dict. Econ. Prod.*]

Zahr-i-mohra, see Magnesia, Vol. V., 108.

ZANONIA, *Linn.; Gen. Pl., I., 839.*

[CUCURBITACEÆ.

1 **Zanonia indica**, *Linn.; Fl. Br. Ind., II., 633; Wight, Ill., t. 103;*

Vern.—*Chirpoti*, HIND.; *Chirabuti*, MAR.; *Penar-valli*, MAL.; *Walrasakinda*, SING.; *Chirpota, dirghapatra, kuntali, tiktaka*, SANS.

References.—*Dalz. & Gibs., Bomb. Fl., 99; Rheede, Hort. Mal., VIII., t. 47, 48, 49; Thwaites, En. Ceyl. Pl., 124; S. Arjun, Cat. Bomb. Drugs, 260; Pharmacog. Indica, II., 94; Drury, U. Pl. Ind., 450; Gazetteer, Mysore & Coorg, I., 61; Agri.-Horti. Soc. Ind., Trans., VII., 64.*

Habitat.—A climbing herb of Assam and East Bengal, the Deccan Peninsula, the Malabar Gháts, and Ceylon.

MEDICINE. Leaves. 2 Plant. 3 Fruit. 4 Juice. 5 Medicine.—According to Rheede the LEAVES, beaten up with buttermilk, are used in South India as an anodyne application. The Sinhalese value the PLANT as a febrifuge (*Thwaites*). The FRUIT is said to possess acrid cathartic properties. The *Hakims* in Bombay assert that the fresh JUICE is very efficacious as an antidote to the venomous bites of the Gecko, known in the Deccan as *shal-i-alam* or "king of the world" (*S. Arjun*). "In Malabar a bath made by boiling the leaves in water is used to remove the nervous irritation caused by boils, and an antispasmodic liniment is made by pounding the leaves with milk and butter" (*Pharmacog. Indica*).

ZANTHOXYLUM, *Linn.*; *Gen. Pl.*, *I.*, 297, 991.

Zanthoxylum acanthopodium, *DC.*; *Fl. Br. Ind*, *I*, 493, [RUTACEÆ. 6

Syn.—Z HOSTILE, *Wall*, Z ALATUM, *Wall*, *Cat* 1209, *in part.*

Vern.—*Nipáli-dhanya, tumra, tejphal, darmar*, HIND, *Tambul*, BENG, *Bogay timur*, NEPAL.

References.—*Gamble, Man Timb.*, viii, *List Darjeeling Trees, Shrubs, etc*, 14, *Kurz, For. Fl Burm*, *I.*, 181, *Dymock, Warden & Hooper, Pharmacog. Ind.*, *I*, 255

Habitat.—A small tree of the hot valleys of the Sub-tropical Himálaya, from Kumáon to Sikkim, ascending to 7,000 feet, and the Khásia Hills, from 4,000 to 6,000 feet. Flowers in short dense cymes ½-1 inch long.

Medicine.—See Z. alatum. MEDICINE. 7

Structure of the Wood.—Yellowish-white, soft. TIMBER 8

Z. alatum, *Roxb.*; *Fl. Br. Ind*, *I.*, 493 9

Syn.—Z HOSTILE, *Wall*, *Cat.* 1210, *in part*

Vern.—*Tumru, tun, timbúr timúr, tesmal, nipáli-dhanya, darmar, tejphal*, HIND., *Gaira, nepáli dhania, tun*, BENG, *Sungrú-kung*, LEPCHA, *Tejbal, timúr, jwarán-tika*, N-W P.; *Tejbal, kababa, tesbal, timmal, timrú*, PB., *Tumburu*, SANS

References.—*Roxb., Fl. Ind.*, *Ed. C.B C*, 717; *Brandis, For Fl*, 47, *Gamble, Man. Timb.*, 60, *also List Darjeeling Trees, Shrubs, etc*, 14, *Pharm. Ind*, 48, *O'Shaughnessy, Beng Dispens*, 264, *U C. Dutt, Mat Med Hind.*, 321, *U. S. Dispens.*, 15th *Ed*, 1539, *Irvine, Mat Med Patna*, 115, *Dymock, Warden & Hooper, Pharmacog. Ind*, *I*, 255, *Baden Powell, Pb. Pr.*, 329, 601; *Atkinson, Him. Dist*, 753, *Birdwood, Bomb. Pr.*, 17.

Habitat.—A shrub or small tree, with dense foliage which possesses a pungent aromatic taste and odour, panicles 2-6 inches, found in the hot valleys of the Subtropical Himálaya from Jammu to Bhután, ascending to 6,000 feet, and in the Khásia Mountains between 2,000 and 3,000 feet. This and the previous species are much alike and often confused with each other. They have both the peculiar smell so characteristic of them. The leaves have a winged rachis in both forms, but in **Z. acanthopodium** the leaves are smaller and more crowded, the fruits form dense cymes and the flowers appear in March, those of **Z. alatum** not till a month or six weeks later.

OIL. Carpels. 10

Oil.—An essential-oil has been separated from the CARPELS by Dr. Stenhouse and later by Pedler and Warden. It is isomeric with oil of turpentine, possesses a similar odour to Eucalyptus oil, and might therefore prove of value as an antiseptic and disinfectant (see para CHEMICAL COMPOSITION).

MEDICINE. Carpels. 11 Fruits 12

Medicine.—The authors of the *Pharmacographia Indica* state that Sanskrit writers call the CARPELS of this species and of **Z. acanthopodium** by the name of *tumburú*, which signifies coriander. The FRUITS of these are so similar as to be very difficult of distinction, and both possess the peculiar flavour of coriander, which fruit they also resemble in size "In Hindu medicines they are considered to be hot and dry. The Chinese also use the carpels under the name of *Hwa-tseaou* or 'Pepper-flower,' and in Japan the carpels of **Z. piperitum** are used. The Arabians appear to have obtained the carpels of **Z alatum** or **Z. acanthopodium** first from Northern India. Ibn Sina, under the name of *Fághireh* (open-mouthed), describes them as 'a berry, the size of a chick-pea, containing a black seed as large as a hemp seed, brought from Sakála in Hindustan.' Sakála or Sangla was an ancient town in the Panjáb, near the modern Sangla-vala Tiba or Sangla Hill. It is the Sangala of Alexander, and was

MEDICINE.

visited by the Chinese pilgrim Hwen Thsang in A.D. 630; it had then a large Buddhist monastery and a stupe 200 feet high. Haji Zein el Attar, who wrote A.D. 1368, gives a similar account of *Fághireh*, and says that the Persians call it *Kabábeh-i-kushádeh* (open-mouthed cubebs)." "The Mahometan physicians consider *Fághireh* to be hot and dry, and to have astringent, stimulant, and digestive properties. They prescribe it in dyspepsia arising from atrabilis, and in some forms of diarrhœa." The

Bark. 13 BARK of these trees is tonic and aromatic, and may be used with advantage in rheumatism and in atonic dyspepsia; the ROOT-BARK is to be

Root-bark. 14 preferred. Heckel & Schlagdenhauffen (*Académie des Sciences, Ap. 21st, 1884*) reported that a crystalline principle, obtained from the bark of a West Indian Zanthoxylum, produced in frogs, rabbits, etc., general paralysis and abolition of the functions of respiration and circulation" (*Pharmacog.*

Branches. 15 *Ind.*). Baden Powell states that the small BRANCHES and THORNS are

Thorns. 16 employed in Northern India as an application for toothache, and that the seeds and bark are prescribed in fever, dyspepsia, diarrhœa, and cholera.

Chemistry. 17 CHEMICAL COMPOSITION.—"The bitter crystalline principle present in the barks of the Zanthoyleæ, and formerly called *Zanthopicrite*, has been recognised as identical with *berberine* by Dyson Perrins (*Trans. Chem. Soc., 1862*). The bark also contains a volatile oil and resins. Dr. Stenhouse has obtained from the carpels of Z. alatum, by distillation, an essential oil to which the aromatic properties are chiefly due. This oil, which when pure is called by Dr. Stenhouse *Zanthoxylene*, is a hydrocarbon, isomeric with oil of turpentine. It is colourless, refracts light strongly, and has an agreeable aromatic odour similar to that of Eucalyptus oil; its composition is $C_{10} H_{5}$. He also obtained a stearopten, *Zanthoxylin*, floating on the water distilled from the carpels and separable from the crude essential oil. After repeated crystallisations from alcohol, *Zanthoxylin* may be obtained in a state of purity, and then presents the form of large crystals of a fine silky lustre, insoluble in water, but readily soluble in alcohol or ether. It has a very slight odour of stearine, and a slightly aromatic taste. It distils unchanged, its fusing point before and after distillation remaining the same, namely, 80°C., and its solidifying point 78°C. Its composition is $C_{10} H_{6} O_{4}$. The essential oil was obtained by Pedler & Warden (1888) by distilling the crushed carpels with seeds in a current of steam. The oil was dehydrated by fused $Ca\,Cl_2$. It commenced to boil at 175° to 176°C., the greater part passing over between 176° to 179°C., the temperature then rose to 181°C., and rapidly to 183°C., when the distillation was stopped. The rectified oil had a specific gravity of ·873 at 15.5°C. Its vapour density determined by Meyer's method was 5.43. They were unable to obtain the crystallisable stearopten isolated by Stenhouse. The freshly distilled oil exposed to 0°C failed to deposit any crystals. In addition to the essential oil, they also detected the presence of a pale yellow, viscid, non-drying oil, an acid resin, and a yellow acid principle, forming deep yellow solutions with alkalis, and reprecipitated from its alkaline solution by acids" (*Pharmacog. Ind.*).

FOOD. Carpels. 18 Food.—The CARPELS are occasionally employed as a condiment.

Structure of the Wood.—Close-grained, yellow; weight from 34 to 46℔

TIMBER. 19 per cubic foot; used for making walking sticks, clubs, pestles, etc. the hemp-plant.

DOMESTIC. Fruits. 20 Domestic.—*Fághireh* (FRUITS) is employed as an ingredient of *guráku* (tobacco for the *hukka*) in certain localities, and in the preparation of a ground-bait for fishing (*Pharmacog. Ind.*). Brandis says the BARK is

Bark. 21 used for intoxicating fish. In Northern India the fruit is said to be used for poisoning fish? (*Atkinson*); and to purify water (*Gamble*). The

small BRANCHES are frequently employed as tooth-sticks, to clean the teeth and are regarded relieving toothache. DOMESTIC. Branches. 22

Zanthoxylum Budrunga, *Wall., Fl Br Ind, I, 495* 23

Syn.—Z. CRENATUM, *Wall*, ? FAGARA BUDRUNGA, *Roxb*

Vern.—*Badrang*, HIND; *Brojonali*, ASSAM, *Mayanin*, BURM

References.—*Roxb, Fl Ind, Ed C B C, 140, Kurz, For Fl Burm, I, 182, Royle, Ill Him Bot, 157, O'Shaughnessy, Beng Dispens, 264, Irvine, Mat Med Patna, 99, Dymock, Warden & Hooper, Pharmacog Ind., I, 256, Agri-Horti. Soc Ind, Trans, VII, 163, Journ (Old Series), IX, Sel, 49, 53*

Habitat.—A tree of the Tropical Himálaya, the Khásia Hills, Eastern Bengal, and Burma.

Medicine.—The CARPELS can hardly be distinguished from those of Z. Rhetsa, and are used similarly in medicine (see below). MEDICINE. Carpels. 24

Structure of the Wood.—Rather heavy, soft, yellowish-white, close-grained (*Gamble*). TIMBER. 25

Z. Hamiltonianum, *Wall.; Fl Br. Ind., I., 494.* 26

Vern.—*Purpuray timur*, NEPAL

References.—*Kurz, For. Fl Burm, I, 181, Dymock, Warden & Hooper, Pharmacog Ind., I., 256*

Habitat.—A climbing thorny shrub of Sikkim, Assam, and Burma

Medicine.—The FRUIT of this species and that of Z. oxyphyllum, *Edgew*, are employed medicinally as a sort of *Fághireh*, with which they have probably similar properties (see Z. alatum). MEDICINE. Fruit. 27

Z. ovalifolium, *Wight; Fl Br Ind, I, 492.* 28

Syn.—Z LUCIDUM, *Wall*; TODDALIA MITIS, *Miq*, LIMONIA LEPTOSTACHYA, *Jack.*

References.—*Beddome, Fl. Sylv., Anal. Gen, xlii, t vi, f 3, Bombay Gazetteer, XV., Pt I., 429.*

Habitat.—A large shrub found in Kanara, Coorg, Nilgiri Hills, and near Madras; also in the Khásia Hills, Assam, the Mishmi Hills and Singapore.

Medicine.—The FRUIT and BARK are not reported to be used in medicine, but probably possess similar properties to those of other members of the genus. MEDICINE. Fruit. 29 Bark. 30

Structure of the Wood.—Light yellowish-white, very hard, close-grained. TIMBER. 31

Z. oxyphyllum, *Edgew; Fl. Br. Ind, I., 494.* 32

Syn.—ZANTHOXYLON VIOLACEUM, *Wall.*

Vern.—*Timur*, NEPAL.

Reference.—*Dymock, Warden & Hooper, Pharmacog. Ind, I., 256*

Habitat.—A climbing prickly shrub of the Himálaya from Garhwál to Bhután, between 6,000 and 9,000 feet; also met with in the Khasia Hills, from 4,000 to 6,000 feet

Medicine.—See Z. Hamiltonianum. MEDICINE. 33

Structure of the Wood.—Yellowish-white, soft, porous. TIMBER. 34

Z. Rhetsa, *DC.; Fl. Br. Ind., I., 495.* 35

Syn.—Z. OBLONGUM, *Wall*, FAGARA RHETSA, ? F. BUDRUNGA, *Roxb*, not of *Wall.*

Vern.—*Sessal, tirphal, tisal, chirphal*, MAR; *Tessul, kokli, chirphal, triphal, sessal, tijabal, tephal*, BOMB. & GOA; *Rhetsa-maram, rhetsa, rhetsa maum*, TEL; *Jummina, jimmi-mara*, KAN.; *Kattú-kina-gass*, SING.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 140, Beddome, Fl. Sylv, Anal. Gen, xli.; Thwaites, En. Ceyl Pl., 69, Dalz. & Gibs, Bomb. Fl., 45, Graham, Cat Bomb Pl., 36, Gamble, Man. Ind. Timb., 60, O'Shaugh-*

ZEA. Maize or Indian-corn.

nessy, Beng. Dispens., 264; S. Arjun, Cat. Bomb. Drugs, 29; Dymock, Mat. Med. W. Ind., 2nd Ed., 127; Dymock, Warden & Hooper, Pharmacog. Ind., I., 255; Lisboa, U. Pl. Bomb., 31, 222; Drury, U. Pl. Ind., 450; Gazetteer, Bombay, X., 404; XV., 79; Ind. Forester, III., 200; Rheede, Hort. Mal., V., t. 34.

OIL. Habitat.—A tree with corky bark and spreading leafy branches, found in the Western Peninsula, from Coromandel and the Konkan southwards, also in Tavoy.

Carpels. 36 Oil.—The essential oil, obtained from its CARPELS, probably similar to that of Z. alatum, is used medicinally.

MEDICINE. Carpels. 37 Medicine.—The CARPELS constitute the Fagara major of the old pharmacologists. They are similar to those of Z. Budrunga, and much larger than the Fagara minor, or *Fághireh* described by Muhammadan writers (see Z. alatum.) In Southern and Western India they are used as a

Oil. 38 remedy for rheumatism, and the essential OIL for cholera. They probably

Bark. 39 possess precisely similar properties to those of Z. alatum, acanthopodium, and other species, and the BARK and ROOT-BARK are also probably

Root-bark. 40 equally valuable.

FOOD. Carpels. 41 Food.—"The unripe CARPELS are like small berries; they are gratefully aromatic, and taste like the skin of a fresh orange. The ripe SEEDS

Seeds. 42 taste exactly like black pepper, but weaker" (*Roxb.*). Both are largely employed in Southern India as condiments, especially with fish curries.

Bark. 43 The BARK is also aromatic, and is used as a substitute for limes and pepper. It is cooked with sugar or honey; and when mixed with onions, mustard-seed, and ginger, makes a good pickle (*Drury*).

DOMESTIC. 44 Domestic.—"*Rhetsa* means a committee, or select number of men assembled to settle disputes, etc., and *maun*, means tree of the largest size. Under the shade of this tree the Hill people '(of South India)' assemble to examine, agitate, and determine their matters of public concern, deliver discourses, etc." (*Roxb.*).

45 **Zanthoxylon triphyllum,** *Wight, Ic., t. 204*; see Evodia Roxburghiana, *Benth.*; see Vol. III., 305.

The following supplementary facts may be given to those furnished in Vol. III.

RESIN. 46 Resin.—Specimens of a resin obtained from this tree were sent to the Madras Exhibition, but the quantity produced did not warrant its being of importance from a commercial point of view (*Drury*).

FOOD. Capsules. 47 Food.—The CAPSULES, which are of about the same size and shape as those of Zanthoxyon alatum, possess similar aromatic properties.

DOMESTIC. Bark. 48 Domestic.—In Amboyna the women prepare a cosmetic from the BARK, which they employ to improve their complexions (*Rumphius, Amb, II., 188, t. 62*).

Zarawand-i-gird, the imported root of Aristolochia rotunda, *Linn.*; [see ARISTOLOCHIÆ, Vol. I., 316.

Zarwand-i-tawil, the imported root of Aristolochia longa, *Linn.*; [see Vol. I., 316.

(*G. Watt.*)

49 **ZEA,** *Linn.; Gen. Pl., III., 1114.*

This very striking genus possesses, so far as is known, only one species and it stands moreover almost by itself in the MAYDEÆ. Its nearest affinities are with **Euchlæna**, *Schrader*, but there are no transitional forms between these very distinct genera, and as **Bentham** says: "With most of the general characters of the tribe to which Maize gives its name, it is exceptional not only in that tribe, but in the whole order, by the manner in which its numerous female spikelets are densely packed in several vertical rows round a central spongy or corky axis. How far this arrangement may have gradually arisen after so many centuries of cultivation can only be a matter of conjecture. Its gradual progress

ZEA Mays.

cannot be traced through the numerous cultivated varieties, many of them described as species in Bonafous's splendidly illustrated monograph, and the idea that some of them are wild indigenous forms must be traced to the insufficiency of the observations recorded by travellers." Of **Euchlæna**, Bentham says that "like **Tripsacum** and **Zea** it has a terminal male panicle with the female spikes in the lower axils wrapped up in broad bracts, but the female spikelets are within each bract superposed in a single row on the articulate rachis of the single spike. The affinity to **Zea** appears to be recognised, for specimens of **Euchlæna** have been received from Schaffner purporting to be known as 'Wild Maize'."

50

Zea Mays, *Linn.*; GRAMINEÆ.

MAIZE, INDIAN-CORN, *Eng.*; BLED DE TURQUIE, *Fr.*; TURKISCH-KORN, *Germ.*; GRANO TURCO O SICILIANO, *It.*; TRIGO DE INDIAS, TRIGO DE TURQUIA, *Sp.*

Vern.—*Bhutta, makka, makai, junri, bara-juár, kukri*, HIND.; *Janar, bhutta, jondr* (in Chutia Nagpur), BENG.; *Jondra*, SANTAL; *Butá, maká*, URIYA; *Makká* or *maká, makai, bhutta, junri, bara-juár*, N.-W. P.; *Mungari, júnala*, GARHWAL; *Bhútta, mukni, junala*, KUMAON; *Makki, makkei, mak, kúkri, bará-juár, chhale, kuthí, juár*, PB.; *Conác*, KASHGAR; *Jaorí, jaodrí, jaori-khurdáni*, W. AFG.; *Mukka*, RAJ.; *Bara-juár, makkái*, SIND; *Makka-jari, makka-jowári*, DECCAN; *Makai, buta*, BOMB.; *Maka*, MAR.; *Makkai*, GUZ.; *Makká-shólam*, TAM.; *Mokkajonna, makká jonnalu*, TEL.; *Mekkejola, musuku jola, govin jol*, KAN.; *Chólam*, MALAY.; *Pyaungbú* (= *flowering-juar*), BURM.; *Yavanala* (according to Birdwood), SANS.; *Khandarús, khálávan, zurratul-makkah, hintohe-rúmí, durah-kisan, durah-shámí*, ARAB.; *Gandume-makkah, khoshahe-makkí, bájrí*, PERS.

NOTE.—The word *Makkai* or *Mekkai*, which is given so very frequently in India as the name of Maize means "of Mecca," and may, therefore, be rendered "Mecca corn." The origin of the equally prevalent name *Bhutta* or *Bhuta* is more obscure. It might be traced from *Bhukta*, Sanskrit, which, in Pali, is *Bhutta*, to eat. Or it is probable that it came from *Bhú* to be borne, to exist, *Bhúta* occurs as having in one of its meanings "a seed" or "rosary bean." It is somewhat significant that this same word *Bhutta* or *Bhuta* is, in the various languages of India, often given to widely different things, but mostly to introduced plants. Thus, for example, in Kumaon *Bhúta* means the Egg-apple (**Solanum Melongena**). **Sir Walter Elliot** assigns the name *Yavanála* to **Sorghum vulgare**, and he suggests that its derivation is from *Yavana*, a general term for a Greek, Muhammadan, etc. This is, however, very possibly not correct; the word may be *Yava* = barley, and *nala* (or in the adjective form *nala*) reed-like. But the name "The Reed-like barley" would be qually applicable to **Sorghum vulgare** and to **Zea Mays**. **Sir Monier Williams** oes not mention *Yavanala* as a Sanskrit name for either of these grains, but he urnishes three words as denoting "Maize." These are *Sasyam*, *Stamba-kari*, and *asyavisesha*. The derivation of these words is probably as follows. *Sasyam*, grain, fact any grain,—a word which may be seen specialized in the Burmese *Saba*, rice husk, and which occurs in the Pali *Sassá*. It is synonymous for "wealth." *amba-kari* denotes a grass which grows in clusters. And *Sasyavisesha* might be dered "remarkable grain." They are thus descriptive words and probably very dern, and more probably denote **Sorghum**, or **Pennisetum** rather than **Zea**.

Conf. with pp. 333, 351.

References.—*Roxb., Fl. Ind., Ed. C.B.C.*, 649; *Stewart, Pb. Pl.*, 263, also in *report on Food of Bijnour District*, 1862; *Aitchison, Kuram Valley Rept., Pt.*, I, 105; *Hooker, Him. Jour.*, I, 148; *DC., Orig. Cult. Pl.*, 387; *V. Hehn, Cult. Plants and Domestic Animals in their Migration*, 384, 497; *Crawfurd, Migration of Cultivated Plants in Reference to Ethnology* (see *Jour. Agri.-Hort. Soc. Ind. N.S.*, I, *Sel.*, 6; *Rev. A. Campbell, Rept. Econ. Pl., Chutia Nagpur*, No. 8221 A.; *Graham, Cat. Bomb. Pl.*, 240; *Mason, Burma and Its People*, 476, 817; *Sir W. Elliot, Fl. Andhr.*, 116, also *paper on Farinaceous Grains, etc., of South India*, in *Trans. Edinb. Bot. Soc., Vol. VII.*, 290; *Forsyth, Report of the Mission to Yarkand, in 1873*, 79; *Stocks, Report on Sind*; *Moodeen Sheriff, Supp. Pharm. Ind.*, 261; *U. C. Dutt, Mat. Med. Hindus*, 270; *Murray, Pl. & Drugs, Sind*, 9; *Bent. & Trim., Med. Pl.*, 296; *Dymock, Mat.*

ZEA Mays.

Localities in which Maize is found.

Med. W. Ind., 2nd Ed., 855; Birdwood, Bomb. Prod., 113; Baden Powell, Pb. Pr., 204, 212, 213-223, 230, 231, 251, 516; Atkinson, Him. Dist. (X., N.-W. P. Gaz.), 320, 687; Forbes Watson, Indian Prod., 10, 43; Royle, Prod. Res., 40, 214, 230, 381; Liotard, Mem. Paper-making Mat., 34; Church, Food-Grains, Ind., 65; Wallace, India in 1887, 201; Mueller, Select Extra-tropical plants, (Ed. 8th), 525; Simmonds, Waste Products, 292; Duthie, Ind. Fod. Grasses of North India, 12; Official Corresp., R. and A. Dept., 1876 to 1879; Ain-i-Akbari, Blochmann's Trans., I., 83; Buchanan-Hamilton, Kingdom Nepal, 284, 312; Port Blair, Settl. Rep. (1870-71), 26; Andaman Islands, Admin. Rep. (1885-86), 54; Kumaon, Official Rep., 279; Gazetteers:—Bikanir, 229; Rajputana, 128, 150; Ulwar, 87; Agri.-Horti. Soc., Ind.:—Trans., I., 165; II., 96, 212-215, 236, 311, Proc., 358; III., 8, 9, 59, 69, Proc., 236, 242, 252; IV., 78, 84, 102, 104, 107, 125, 146, 150, 236; V., 60-64, 80-82, Proc., 48, 85, 88; VI., 240, 243, 245, 247; Proc., 7-9, 24, 35, 60, 104; VII., Proc. 37, 95, 138, 153, 193; VIII., 22, 96-97, 176-181, 225, 233, 235-237, Proc., 336; Journals:—II., Sel., 140, 294, 367, 541, 544; III., Proc., 59, Sel., 196; IV., Sel., 31, 33, 152; IX., Sel., 59; X., 359. Sel., 24; XI., Proc., 82; XIII., Sel., 51; XIV., 44; New Series:—I., Sel., 7, 14; II., Sel., 57, 70-79; IV., 25; V., 80-94; Proc., (1875), 12, 27, 43, (1876) 6-8, 16-18, 37, 38; VI., Sel., 52-58, 82-85, Proc. (1880), 36; VII., 92-95, 199-203, 356, Sel. 37, 38; Proc., 35, (1883), 104, 105, 107-108, 111, 174, 175; VIII., Proc., 48, 68; Indian Agriculturist, 18th Sep. 1886; Indian Forester, IX., 203; Quarterly Jour. Agri., I., (1828-29), 484; III., (1847-48), 81; IV., 1849-51) 74; VIII., (1857-59), 115; Smith, Econ. Dict., 257, 258; Treasury of Botany, II., 1248; Balfour, Cycl. Ind. Spons' Encyclop.; Encycl. Brit., XV., 309; Morton, Cycl. Agri., II. 1171; Ure, Dict. Inds. Arts & Man., III., 20.

DISTRIBUTION. 51

Habitat, Distribution, and Forms.—This most useful grass is now cultivated, it might almost be said, throughout the world. DeCandolle presumes that it was originally a native of New Granada from the circumstance that, since it can be shown to have been cultivated from a remote antiquity by both the Peruvians and the Mexicans, it most likely was diffused from an intermediate region. Although unknown to Europe prior to the discovery of America, it has been cultivated for so many centuries in the New World as to have not only lost all trace of its wild habitat but to have become so obedient to man's necessities as to have yielded an extensive range of forms. In consequence there are conditions of this protean species suited to moist tropical regions, to burning arid tracts, to temperate zones, and it might almost be added to arctic climes. The modifications in stature, foliage, and grain are no less significant; but, as pointed out by Darwin (and subsequently fully confirmed), most if not all the forms of this plant are but climatic states and are hardly, therefore, entitled to be called races. They are, in fact, forms that tend to disappear when conveyed from one region to another. Thus, for example, some few years ago the effort was strenuously made to acclimatise the

Cuzco Maize. 52

Cuzco maize in India. Large supplies of seed were freely distributed by Government. The verdict pronounced on the crop was, however, singularly uniform, *viz.*, that where it was found possible to secure fertile seed, the properties of the introduced plant were in a few years entirely lost. Degeneration at once took place and was only greater and more rapid in the localities most dissimilar to the Andes than in those that approached the climatic conditions of the valley of Vilcamaya. It was on this account that Markham wrote in terms of strong disapproval of the Indian experiments. "The Cuzco maize," he said, "should not have been sown in the plains of India;" nor does it, he added, grow on a high and rainless tableland. The Cuzco maize sown in Bengal grew so tall and rampant that it failed to mature seed at all. But it seems likely that, had the experiment been persisted in, till seed had accidentally been obtained, less and less trouble would have been experienced in seeding until a stock had

DISTRIBUTION.

been produced that would have differed in no material respect from that of the country. And this result was arrived at in many stations through-

Cuzco Maize.

all trace of its original characteristics. Not only Cuzco maize but many other famed American forms have been, for years past, systematically cultivated at Government Experimental Farms and Botanic Gardens, etc., until it might almost be said that it would save much unnecessary trouble and expense to have a paragraph prepared and stereotyped ready for reproduction as the special report of each fresh experiment. Such a para-

Conf. with pp. 336, 337, 347, 348.

[illegible] from exist-ing stock, vast improvements might be effected. Fixity of merit however accomplished, must be secured for each district, if not for even areas of smaller size than districts. There can be no doubt but that maize came

[illegible]

54

the Himalayan slopes and inner valleys up to an altitude of 9,000 feet above the sea. On the lower or Gangetic plains it is grown chiefly as a green vegetable, as it was in Roxburgh's time when he spoke of it as "a delicacy." In the vicinity of all large towns the sale of the unripe cob is so remuner-

A 6 months' Crop or 3 months' Crop.

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ingly seen in the fact that in many parts of India there are forms of maize that require six months to mature, while in others maize is at most a three-months' crop. In some parts of the country, indeed, both kinds may be seen grown separately or as mixed crops. As a further manifestation it may be added that where the transition of the seasons into the

long in use in America as a poultice, and gruel is also made of it. In the Concan an alkaline solution is prepared from the BURNT COBS and is given in lithiasis." In the United States and elsewhere the meal is much used in the hospitals, and makes an excellent emollient poultice. Gruel prepared from it is also stated to be sometimes more grateful to the sick than that made from oat-meal (*Bentley and Trimen*). MEDICINE. Cobs. 65

SPECIAL OPINION.—§ "The centre of the COB (core) deprived of the seeds and reduced to an ash by burning, is given in combination with common salt in bronchial catarrh and hooping cough. The dose is 10 grains, Core. 66

[illegible]

CHEMISTRY. 67

of potash, or nearly twice as much as the best specimens of wood. The North American corn crop for 1871 was calculated to have yielded 7,700,000 tons of cobs, which are supposed to have contained 115½ million pounds carbonate of potash (*Journ. Soc. Arts, Dec. 1882*). Most writers

[illegible]

FOOD & FODDER. Ripe Grain. 68

there could be no mistake, was caused through the patient having eaten roasted maize. Meal. 69

Food and Fodder.—In the Panjáb, the North-West Provinces and Oudh maize assumes the position of a staple article of food. It is, however, grown throughout the length and breadth of [illegible] Upper [illegible] o bread, [illegible] as por- [illegible] are eaten after being roasted or boiled. Flour. 70 Green cobs. 71 Parched Grain. 72

The ripe grain is also very often PARCHED and in that state is eaten as a midday meal. In Upper India there are generally two crops—the one a little earlier than the other and eaten as a green crop, the later crop only being allowed to ripen. The straw (STEMS and LEAVES) of the ripe crop is not of great value as a fodder (except for elephants), but the crop reaped in the green state affords a much valued fodder. In many parts of the [illegible] le value is put [illegible] Stem. 73 Leaves. 74

[illegible] Europe and [illegible] horse-food, but [illegible] food. It is [illegible], Polenta [illegible] which is [illegible] especially valued for its fattening properties. A kind [illegible] known as [illegible] which is [illegible] 75 76 77

[illegible]

made of maize flour is largely eaten in the Panjáb. [illegible] says that maize is not considered so wholesome as wheat, [illegible] rather heating. Its nutrient-ratio is 1 : 8 [illegible] The Indian forms of maize, Professor Church says [illegible]

fuel" (*A. Campbell, Nepal, Trans. Agri.-Hort. Soc., IV., 127*). "The STEMS are left on the ground and are gathered and burnt as fuel" (*Agri. Report, Lohardaga District*). Recently cobs compressed into a hard structure have in Europe been employed in the preparation of tobacco pipes. DOMESTIC Fuel 90 Tobacco Pipes. 91

HISTORY.

HISTORY. 92

It is now universally admitted that Maize or Indian-corn is a native of America. Formerly, but upon the most unsatisfactory evidence, it was believed by some writers to have been known in Europe prior to the discovery of America. DeCandolle on this subject writes: "No one

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uch two cru-
onferrat, gave
and a purse
, unknown in
meliga, etc."
others maize:

but adds DeCandolle "These old discussions have been rendered absurd by the Comte de Riant's discovery that the charter of Incisa is the fabrication of a modern imposter." "I quote this instance, continues DeCandolle, to show how scholars, who are not naturalists, may make mistakes in the interpretation of the names of plants, and also how dangerous it is to rely upon an isolated proof in historical questions." The various names which it bears in Europe, Egypt and Asia only show that

where apparently carried with it any trace of its aboriginal names

* See the note which concludes the paragraph above on vernacular names p. 327. Conf. also with remark regarding Behar names, p. 351.—*Ed., Dict. Econ. Prod.*

Maize or Indian-corn. (*ll*) | ZEA Mays.

HISTORY.

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· ·y nau maize.
· · ıne poor people live much on
ı ...y after the appearance of Roxburgh's *Flora Indica*, however, Graham, in his Catalogue of the Plants of Bombay (published 1839), wrote of Western India that maize was "commonly cultivated " Dalzell & Gibson, some thirty years later (1861), said that it was "extensively grown in the early part of the rains, especially near large towns" And these authors add: "The grain is seldom used in India as a flour." But as illustrative of the extremely local character of the information often furnished by Indian writers it may be added that Stewart, in 1862, wrote of Bijnour that "much of the maize was ground into flour and made into bread, although very much less is here used in this way than in the Panjáb." It is thus very probable that in Upper India (a region, comparatively speaking, unknown to Roxburgh) maize was much more extensively grown at the beginning of the century than might be inferred from Roxburgh's words. At the present day it would be more nearly correct at any rate to speak of maize as of equal value to the people of India collectively with wheat, instead of its being grown purely as a garden "delicacy" It is a field crop upon which at ... boriginal tribes of the hilly tracts ... or subsistence ... ught almost be ... atement often ... ey can scarce- ... customs, even when these can ... their best interests So completely has India now appropriated the *Makkai* that few of the village fathers would be found willing to admit that it had not always been with them ... , a staple article of diet. They may ... nes and quote wise say ... ery few years ago the ... -gether different plant. T ... anjab, *juár* means maize, not Sorghum vulg..., the latter crop being known as *charí*—fodder. In some parts of South India *Chôlam* or *Sholam* means maize, it has thereby appropriated the name for Sorghum. In the same way the Persians often give the name *bájri* to maize instead of to the millet Pennisetum typhoideum. Alluding to the manner in which maize may revive after a spell of drought the proverb runs—

Becomes general in the 19th Century 95

Confused with Sorghum. 96

> "When maize* droops the farmer laughs
> When wheat is laid he laments."

It has been pointed out that mention is made of maize in a Chinese work which dates from 1578 (according to Bonafous) and 1597 (according to Mayers). "If this be true, says DeCandolle, and especially if the second of these dates is the true one, it may be admitted that maize was brought to China after the discovery of America. The Portuguese came to Java in 1496, that is to say four years after the discovery of America, and to China in 1516. Magellan's voyage from South America to the Philippine Islands took place ... y-eight or seventy-seven ... the Chinese work, ... avigators from America

Maize had reached Europe a short time before the dates mentioned for India and China. "The first botanist who uses the name, Turkish

* Juári—originally Sorghum.

Historical Sketch of

HISTORY.

the plant was indigenous where such names were given to it, but the probability is that they were taken from some native plant bearing a resemblance to maize." In another sentence he removes any possible misconception of his meaning, for he says "Maize is, beyond all question, a native of America, and before the discovery of the New World was wholly unknown to the old" (*Migration of Plants in reference to Ethnology*). DeCandolle in refutation of Crawford's *supposed* opinion, that it had or may have had an Asiatic origin, proceeds to show that the fact of Rumphius being silent regarding the plant, points to a later introduction than the seventeenth century. Here, again, it is possible an error may be inculcated, for although Rumphius was undoubtedly one of the greatest of the early Asiatic botanists he might easily have regarded an American plant of recent introduction as deserving of no special consideration by him. Royle (*Prod. Resources, p. 40.*) says that the Portuguese very probably introduced the richest products of America into India, such as Maize, Capsicum, Guava, Custard-apple, and Pine-apple. And there is much to be said in favour of this suggestion. The *Ain-i-Akbari*, which may be designated the Administration Report of the Emperor Akbar for the year A.D. 1590, contains what the writer regards as an undoubted reference to Pine-apple and an accidental allusion to what has been translated maize. If there can be no mistake regarding the former, then it might perhaps be admitted there was at least a plausibility for the accuracy of the latter, since both plants are American. The pine-apple is described as having "leaves like a saw. The fruit forms at the end of the stalk, and has a few leaves on its top. When the fruit is plucked, they cut out these leaves, separate them, and put them into the ground; they are the seedlings. Each plant bears only once, and one fruit only." In the *Toozuk-i Jahángírí* (edited by Sayyid Ahmad, *p. 3*) it is stated that in the time of Jahangir pine-apples came from the harbour towns held by the Portuguese. While Abal Fuzl, in his long list of grains and pulses grown in India during the sixteenth century, does not include maize, under his chapter on the beautiful flowers to be seen at the Court of Akbar, he says of *kewrah*, that its leaves are like those of "maize" (*Blochmann's Transl. Ain-i-Akbari, p 83*). Linschoten, one of the most painstaking Indian explorers of the sixteenth century, makes no mention of maize as seen by him in the East. In the eighteenth century Burmann published his *Thesaurus Zeylanicus* and his *Flora India*, but in neither of these works does he allude to Zea. Hove, who at the close of the last century, visited Bombay in order to study its cotton, and whose report is full of information on all the crops seen by him, does not apparently mention Indian-corn. Now it would, as it seems to the writer, be unsafe to assume that, although the pine-apple was fully known in the sixteenth century, so extremely valuable a plant as the maize did not reach India until after the date of Rumphius' works. It is quite clear, however, that it was little more than experimentally grown for, perhaps, two centuries after its introduction, and that when once acclimatised and on its properties having been made known it was thereafter rapidly distributed over the length and breadth of India. Its name *makkai* may be regarded as manifesting the association of the distribution of the grain with the Muhammadan rulers of India, and its displacement or appropriation of the names formerly given to the introduced forms of Sorghum may be viewed as denoting the innate propensity of Asiatics to contrast all new ideas with previous conceptions. So very little progress had, however, been made with maize cultivation that Roxburgh wrote, about the beginning of this century, that Indian-corn was "cultivated in various parts of India in gardens, and only as a delicacy; but not anywhere on the continent of India, so far as I can learn, as an extensive crop." In 1819 Buchanan-

Probable Introduction in the 16th Century. 93

Not cultivated in the 18th Century. 94

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Hamilton published his account of the kingdom of Nepal; while dealing with the ancient state of Yumila (its capital Chhina-chin) says that they had maize. In a further page he remarks of Kangra: "The poor people live much on maize." Very shortly after the appearance of Roxburgh's *Flora Indica*, however, Graham, in his Catalogue of the Plants of Bombay (published 1839), wrote of Western India that maize was "commonly cultivated." Dalzell & Gibson, some thirty years later (1861), said that it was "extensively grown in the early part of the rains, especially near large towns." And these authors add: "The grain is seldom used in India as a flour." But as illustrative of the extremely local character of the information often furnished by Indian writers it may be added that Stewart, in 1862, wrote of Bijnour that "much of the maize was ground into flour and made into bread, although very much less is here used in this way than in the Panjáb." It is thus very probable that in Upper India (a region comparatively speaking, unknown to Roxburgh) maize was much more extensively grown at the beginning of the century than might be inferred from Roxburgh's words. At the present day it would be more nearly correct at any rate to speak of maize as of equal value to the people of India collectively with wheat, instead of its being grown purely as a garden "delicacy." It is a field crop upon which at least the bulk of the aboriginal tribes of the hilly tracts of India are very largely dependent for subsistence. Thus its diffusion over India, during the present century, might almost be said to be one of the most powerful arguments against the statement often made that the Natives of India are so very conservative that they can scarcely be induced to change their time-honoured customs, even when these can be shown as inimical to their best interests. So completely has India now appropriated the *Makkai* that few of the village fathers would be found willing to admit that it had not always been with them as it is now, a staple article of diet. They may even cite its supposed ancient names and quote wise sayings regarding it, oblivious all the while that a very few years ago these were universally accepted as denoting an altogether different plant. Thus, in many parts of the Panjáb, *juar* means maize, not Sorghum vulgare, the latter crop being known as [illegible]. In some parts of South India *Cholam* or *Sholam* means maize; it has thereby appropriated the name for Sorghum. In the same way the [illegible] give the name *bájra* to maize instead of to the millet *Pennisetum typhoideum*. Alluding to the manner in which maize may [illegible] a spell of drought the proverb runs—

> "When maize* droops the farmer laughs
> When wheat is laid he laments."

Becomes general in the 18th Century

95

[illegible]

It has been pointed out that mention is made of maize in a Chinese work which dates from 1578 (according to [illegible]) [illegible] to Mayers). "If this be true, says DeCandolle, and [illegible] second of these dates is the true one, it may be assumed [illegible] brought to China after the discovery of America. [illegible] to Java in 1496, that is to say four years after the discovery [illegible] and to China in 1516. Magellan's voyage [illegible] Philippine Islands took place in 1520. During the [illegible] seven years between 1516 and the date [illegible] seeds of maize may have been taken to China by [illegible] or from Europe."

Maize had reached Europe a short time before [illegible] for India and China. "The first botanist who [illegible]

* [illegible] Sorghum.

ZEA
Mays.

Cultivation of Maize

HISTORY.

wheat, is Ruellius, in 1536. Bock or Tragus in 1552, after giving a drawing of the species which he calls Frumentum turcicum, *Welschkorn*, in Germany, having learnt by merchants that it came from India, conceived the unfortunate idea that it was a certain *typha* of Bactriana, to which ancient authors alluded in vague terms. Dodoens in 1583, Camerarius in 1588, and Matthiole rectified these errors, and positively asserted the American origin. They adopted the name *Mays*, which they knew to be American" (*DeCandolle*). It is perhaps unnecessary to continue the quotation from DeCandolle's very instructive historic sketch of the literature of this subject in order to show that so little was known of maize in Europe that for some time the early travellers in the New World expressed their astonishment regarding it. Nor is it necessary to review the records of America that point to a great antiquity for the crop in that country. Suffice it to recapitulate that philology and history alike confirm the opinion that maize was originally a native of America. Nor is botanical evidence wanting in support of that view. Mays is not only the sole representative to the genus Zea but it stands almost alone in the family. There are no Asiatic wild plants in any way closely related to it. Darwin found heads of maize imbedded on the shore in Peru along with several marine shells, but at a height of 85 feet above the present level of the sea. This necessitates a vast antiquity, a fact also indicated by an ancient cultivation denoted through the discovery of two forms (now extinct) in tombs apparently prior to the dynasty of the Incas. The aboriginal form has not as yet been found in a wild state. The effects of long cultivation are, however, seen in the extreme variability of the plant. Its rapid adaptations both in size of plant and shape and colour of grain, to certain conditions of climate and soil, are very remarkable. A supposed aboriginal form, discribed by Saint Hilaire as Zea Mays tunicata and which Bonafous figured under the name of Zea cryptosperma, is by no means the most remarkable form nor is the presence of a sheath to each grain (the character that gave origin to these names) more stable under altered conditions of cultivation than many of the less striking characteristics of other races. Indeed, it may be doubted whether any of the forms of maize are entitled to be regarded as races. The peculiarities are for the most part climatic adaptations that rapidly disappear under altered environment. Thus Darwin tells us "that tall kinds grown in southern latitudes, and therefore exposed to great heat, require from six to seven months to ripen their seed; whereas dwarf kinds, grown in northern and colder climates require, only from three to four months. Peter Kalm, who practically attended to this plant, says, that in the United States, in proceeding from south to north, the plants steadily diminish in bulk." Adaptation to climate, Darwin adds, is very nearly as striking as in the summer and winter wheats, and the change from the one into the other may be effected only gradually. The influence of the climate of Europe on American maize, according to Metzger, for example, was a loss in height and a complete change in the shape and colour of the grain. "In the third generation nearly all resemblance to the original and very distinct American parent form was lost. In the sixth generation this maize perfectly resembled a European variety." Darwin adds: "These facts afford the most remarkable instance known to me of the direct and prompt action of climate on a plant. It might have been expected that the tallness of the stem, the period of vegetation, and the ripening of the seed, would have been thus affected; but it is a much more surprising fact that the seeds should have uudergone so rapid and great a change" (*Animals and Plants under Domestication, I., 320-323*). These observations, it will be seen, by the remarks in another chapter of this article, have a peculiar significance in India. We possess not only tall

Climatic variations, 97 *Conf. with p. 329.*

Character of grain altered, 98 *Conf. with pp. 340, 347, 348.*

ZEA Mays.

HISTORY.

tropical forms and dwarf alpine states, but kinds only serviceable as green vegetables and others that yield grain rich in starch, others in glucose! The experiments performed hitherto in India (with a view to improving the local stocks) might almost be said to have failed mainly from a disregard of the accepted principles which should have governed their procedure. States of the plant suited to temperate regions have been experimented with in the tropics with the not unnatural result of failure. Tropical conditions that require six months to mature their grain have been experimented with in regions that either did not possess more than four months suitable weather or where the cultivator did not care to have his soil for such a long period under the crop. The result, disappointment or neglect. The whole subject of the maize cultivation of India is so very little understood, that comparatively few persons seem to be aware that in many parts of the country there are two crops a year which differ from each other very nearly as greatly as do the rampant conditions of the tropics from the dwarf states of the temporate zones. An expenditure of much time and money has been entailed by experiments at acclimatising certain American forms, the result of which might have been foreseen, *viz.*, the gradual loss of all the characteristics of the American stock and the production in a very few years of a form that differed in no material respect from those already in the country. Acclimatisation is, therefore of comparatively little avail with a plant, which, like maize, is subject to rapidly change almost every one of its characteristic features under dissimilar conditions to those by which it was nurtured and developed. So, again, all writers are agreed that to preserve pure the varieties of maize, they must be grown at sufficient distances apart to prevent the crossing that will otherwise freely take place. With maize, it may in conclusion be said that fixity of characteristics, whether these have been attained by selection, crossing, or acclimatisation, is only possible within the very narrowest climatic changes. Each province, indeed almost each district, must, therefore, develop its own forms. Acclimatisation, while it may accidentally give a useful new kind of maize, will rarely if ever reproduce the conditions desired by the importation of a supply of foreign seed of reputed properties. These and such like features of Indian-corn are of the most potent character in the study of the agricultural aspects of this subject, but in the present historic chapter they have their bearing in the manifestation of ancient cultivation as given by multiplicity of form and variability or adaptability to man's requirements.

Indian Experiments. 99 Conf. with p. 9

Two Crops in India. 100 Conf. with pp. 330, 344

Selection to local conditions essential. 101

CULTIVATION.

CULTIVATION. 102

The material at the writer's disposal is too meagre and unscientific to justify an attempt at describing or even classifying the forms of Indian corn met with in this country. He must, therefore, rest satisfied with having briefly indicated, in general terms, under the paragraphs of **Habitat** and HISTORY, the wide range that must exist, from the diversified conditions under which the crop is raised and the influences and necessities that have controlled natural selection. In the paragraphs that follow, the reader will find that the customary procedure of this work has been followed, *viz.*, to furnish under provincial sections a selection of passages, calculated to convey an idea of the position of the industry and the systems of cultivation adopted by the Indian *rayats*.

Area of Cultivation.—The area under maize in India can scarcely be determined, since nearly every peasant grows a few plants near his homesteads and these must of necessity escape estimation. Roughly speaking, it may be said that the bulk of the crop, which is eaten as a green vegetable,

Area. 103

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Cultivation of Maize

CULTIVATION

Area.

is excluded from the calculated area. In the annual returns of agricultural statistics several provinces, such as Bengal, furnish no estimates, in others maize is grouped with millets. The seriousness of this latter fact may be here shown. The Panjáb does not give separately (in the report for 1890-91) its maize crop, but in a special report issued in 1885-86 it was ascertained that the average area under maize for the three previous years had been 1,215,206 acres. The surveyed maize area for the rest of India (in 1890-91) came to 1,789,057. These two returns show, therefore, a total of 3,000,000 acres, and were a provision made for Bengal, Central India, Rájputana, Burma, Assam, Hyderabad, etc. (provinces for which no returns of maize cultivation have been furnished), it seems likely that the total might exceed rather than fall far short of 5 million acres per annum as under this crop. The Panjáb appears, however, to be by far the largest Indian-corn producing province of India and is followed by the North-West Provinces with (in 1890-91) 978,653 acres, Oudh with 476,036 acres, Bombay with 137,457 acres, and the Central Provinces with 106,659 acres. So far as these figures go, therefore, it might be said the maize area of India closely corresponds with that of wheat and that the grain is least produced in rice-growing provinces.

Total probably 5 million acres.
104

PANJAB.
105

1.—PANJAB.

References.—*Gazetteers:—Rawalpindi, 52, 78, 80, 81; Ludhiana, 133-138, 140, 143, 159; Hazara, 52, 129, 130, 134-137, 147, 150, 151; Sialkot, 34, 65, 68; Gujrat, 77, 79, 81; Jhelam, 55, 98, 100, 108; Kangra, I., 60, 61, 153, 155, 157, 158, 161; Kangra, II., 24, 58; Shahpur, 37; Peshawar, 84, 144, 146, 157, 159; Gujranwala, 27, 47, 48, 51, 55; Jalandhar, 18, 44; Gurgaon, 73; Delhi, 44-46, 101, 113, 114, 139, 140; Montgomery, 54, 88, 103, 104, 106, 111; Amritsar, 19, 20, 35, 36, 47; Lahore, 48, 86, 89; Bannu, 53, 138, 145, 150; Kohat, 60, 101, 104, 105, 121, 122; Jhang, 48, 107, 115; Dera Ghazi Khan, 84; Ferozepore, 65-69, 74; Hisar, 46; Mooltan, 111; Dera Ismail Khan, 144; Hoshiarpur, 35, 86, 87, 91, 92; Ambala, 31, 32, 44; Karnal, 157, 172, 176, 185, 197; Simla, 37, 39, 53, 57, 78; Settlement Reports:—I. (Hoshiarpur), 11, 23, 31; (Kangra) (1850), 4, 24, 2ʻ, 27, 30, 31, 44; (1865), 78, 144; (Sialkot), 31, 33; II., Lahore, (1860), 11; (1865-69), 9, 33, 54; IV. (Dera Ghazi Khan), 130, app., cxvi; (Peshawar), 184, 188, 215, 219, 223, 225, App. xxxiv, xlii, lxvii, lxxv, lxxxv, ciii-cviii, cxvii (ix); V. (Ferozepore), 3, 7, 31, 33, (Muktsar), 22, 25; (Rawalpindi), 59; (Shahpur), app., iii; VI., (Gujrat), (1860), 136; (1870), 33, 34, 79, 84; (Montgomery), 102, 107-109, 115, 116, 126, 128; VIII. (Bannu), 53, 80, 85, app. xxi; ix., (Hazara), 81, 88-90, 102, 103, 173, 174, 178, 192, 194, 196, 202, 204, 207, app., lxxxviii, xc, civ, cvi, cviii, cx, cxii, cxiv, cxvi, cxviii, cxx, cxxii, cxiv, cxvi; X. (Simla), 10-15, 42, 44, 45, xxxix; XI. (Delhi), 43, 106; 224, app. xxxv, cclxvii; (Kohat), 2, 12, 73, 74, 120, 122-124, 155, 162-164; Kohat, 122-124; Jhang, 85-94; Selections from Records Fin. Commissioner (1887), pp. 780-836.*

Area.
106

Area.—Some few years ago the Commissioner of Settlements and Agriculture (the late Colonel Wace) issued a circular letter calling for information on the subject of maize cultivation in the Panjab. The replies which were obtained brought together a detailed statement such as exists for no other province on the extent, position, and nature of the maize cultivation. These replies were published in the form of Selections from the Records of the Financial Commissioner's office in 1887. Reviewing these district reports it was pointed out "that little or no maize is grown in the western and south-western districts of Hissár, Rohták, Gurgáon, Jhelum, Shahpur, Jhang, Montgomery, Mooltan, Muzaffurgarh, Dera Ghazi Khan, and Dera Ismail Khan." The crop is "mostly grown where the summer rainfall is highest, that is, in the montane and sub-montane districts.

CULTIVATION in the Panjab

The proportions of irrigated and unirrigated maize in the last two years were—

	1884-85	1885-86.
Irrigated	477,713	464,468
Unirrigated	770,547	717,684
TOTAL .	1,248,260	1,182,152

and about five-sevenths of the unirrigated maize is grown in the hill districts of Hazára and Kángra, and the sub-montane districts of Hoshiarpur and Umballa, where the rainfall is good and practically certain. The crop will not thrive without abundant moisture, and where the rainfall is insufficient, there must be irrigation But too heavy rain or long continued cloudy weather are nearly as bad as drought Maize likes moderate and constant showers, with alternating sunshine It also requires a rich soil, and is usually grown in the highly manured belts of land around the villages or detached farms. It is scarcely ever grown on poor soil. If the land growing maize is manured, it will usually be found that the soil is intrinsically rich, or has received a good alluvial deposit from stream. The Panjab cultivator generally recognises the importance of not growing maize plants very close together unless sown merely for fodder. It is nowhere the custom, as in America, to sow three or four seeds in separate little mounds of earth."

Yellow Crop. 107 White. 108

"The common maize in the provinces is yellow. The white kinds are little cultivated, though they are prized near towns for roasting in the cob. The plant has many uses. The cob is often roasted before quite ripe, or the ripe grains are parched, or the flour is made into porridge or bread. The grain is also sometimes given to horses or cattle, and the stalks and the leaves are used as fodder As the farmer cultivates maize in his best land, he does not care for any variety that occupies the ground for more than 80 or 90 days, for he looks to cut his maize crop in September or October, so as to be able to clear the ground for wheat or some other winter crop. It would be useless to attempt to introduce any variety of maize that occupies the ground too long, or that is not hardy and will not stand a slight drought, or that is too easily blown down by high winds Some attempt has been made to introduce good kinds of American maize, but no variety has as yet become popular."

The above brief review of the leading facts brought out by the district reports was furnished by the Panjáb Government, and space can hardly be afforded in this work for giving much more. It may be said, however, that in the appendix to the report a table is furnished of the area under the crop from which the following may be given in the order of importance as the chief districts :—

DISTRICTS	Average of three Returns previous to 1885-86.	Percentage of Area under Maize to total cultivation.	Average rainfall for the months from 1st June to 30th September.
Hazára	193,583	47	24
Kangra	137,188	29	55
Hoshiarpur	135,787	19	27
Amballa	121,243	12	28
Peshâwar	91,114	10	5
Jullundar	76,383	11	22
Siálkot	67,231	7	27

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Cultivation of Maize

Districts.	Average of three Returns previous to 1885-86.	Percentage of Area under Maize to total cultivation.	Average rainfall for the months from 1st June to 30th September.
Gurdáspur	53,992	6	24
Ludhiána	51,985	7	23
Ráwalpindi	49,609	4	20
Amritsár	36,109	5	20
Lahore	36,085	3	16
Bannu	31,443	4	7
Ferozepore	28,714	2	17
Simla	1,649	16	52

There are one or two considerations brought out by the above statement that are of no small importance. In Házára maize cultivation occupies 47 per cent. of the total cultivated area, in Kángra 29 per cent., in Hoshiarpur 19 per cent., in Simla 16 per cent., in Jullundar 11 per cent., and in Peshawar 10 per cent. Leaving out of consideration the wide range in altitude, embraced by the districts named, there is another fact exemplified by the table. The rainfall in two of the districts (and these might be called temperate regions), namely, Kángra and Simla, is normally 55 and 52 inches, respectively, during the months when the crop is grown, while in a third, Pesháwar—one of the hottest tracts of India during those months—the rainfall is only 5 inches. Such facts as these forcibly display the extensive series of forms of maize that must exist even in this one province of India, and they demonstrate also the adaptations that have been accomplished before the crop could be one of such importance as it undoubtedly is to the people of the Panjáb.

Conf. with pp. 336, 347.

The circular letter issued by the Commissioner of Settlements and Agriculture (March 1884) to which the local reports constituted the replies, asked that attention should be given to certain points. These were:—

1st.—The varieties grown and the circumstances under which each is preferred.

2nd.—The system of cultivation and rotation pursued.

3rd.—The date of sowing, reaping, etc.

4th.—The estimated yield per acre.

5th.—The consumption of the grain and stalks.

6th.—The diseases to which the crop is liable.

The replies to these and such like questions are so highly instructive that it is unfortunate space cannot be afforded to republish the report in its entirety. It may, however, be useful to give here a few facts under each of these questions.

Varieties. 109 Amritsar. 110

Varieties cultivated.—In Amritsar there are said to be four qualities: the 1st quality produces cobs of about 9 inches in length, the grains are yellow, sweet in taste and more durable than any of the others. The 2nd quality has cobs not more than 6 inches in length. The produce is much lower than the first; it is sweet in taste, hard in grinding but durable. The 3rd quality grows commonly near the villages on the banks of the Ravi. Its cobs are 6 inches long, but the yield is much less than with the yellow maize. The 4th quality called *Lahori* maize has cobs only four inches long and the grains are only half the weight of those of the first quality. The stalks are, however, soft and are used for cattle food. It is also useful in another respect. If the times for sowing yellow and white maize have past this

form, even if sown in the beginning of *Bhádon* (15th August) grows till *Asu* (September-October) and ripens its crop in two to two-and-a-half months. CULTIVATION in the PANJAB.
In HAZÁRA, Mr. Kennedy says, there are four kinds of maize—two of which Hazara 111

Gurdaspur. 112

Pathankot 113

be sown much later, say after the rainy season sets in, but it will then ripen at the same time as the yellow. But it may be added that while these differences exist, it is currently believed in Batala tahsil that if the white be grown for four years consecutively, it will become yellow. Of RÁWALPINDI the Settlement Officer reports that there are two forms all but Rawalpindi 114
d yellow
s *Sattri*,
chiefly
climate.
when

Hoshiarpur 115

Lahore. 116

Peshawar. 117

tahsil and sporadically elsewhere also, the red variety is found. The white variety is preferred as it is softer and sweeter than the others. But it requires more careful cultivation and irrigation The white variety is

Karnal 118

the yellow may often be seen shading off to the red. The Deputy Commissioner of KOHAT writes that maize in the Kohát and Hungu tahsils is nearly as important as wheat. There are two varieties grown, (1) *Sarda*, Kohat. 119

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Cultivation of Maize

CULTIVATION in the PANJAB.

Ludhiana. 120

usually of a white colour—the early sowings; (2) *Garma*, a yellowish kind—the late sowings. The first of these is in most favour for making bread, while for parching the second is preferred. In Kohát maize has completely appropriated the name *jowar*. In LUDHIANA three forms of Indian corn are grown, *viz.*, yellow, white, and red. The yellow is the most abundant, but the white ripens sooner and is in some cases preferred on that account. The red is not grown by itself but appears among either of the other two kinds.

Kangra. 121

In KANGRA (Kullu) Mr. Dane wrote there are three local forms grown, (1) *Sathu*, so called because it ripens in sixty days; (2) *Tandara*, named because of the length of the stalk and of the cob, and (3) *Rohru*, an inferior form so named because of its small size. The first is most generally preferred as it can be grown as a second crop, but the second gives the finest result, though it occupies the ground for six months and thus prevents a spring crop, while the third is only grown on inferior lands or by indolent cultivators.

Amballa. 122

Of AMBALLA it has been said there are two varieties—a white with large, and a yellow with smaller cobs. "The yellow variety gives bread of better flavour; but the white, when parched, swells out to a larger size, and is said to be better suited to old, toothless people. There is said to be more gluten in the yellow variety, which renders it palatable, and being richer in nitrogenous flesh-forming compounds, it is probably more nutritious than the white and is certainly more largely grown."

The above briefly reviews the chief facts brought out in the special series of reports on the varieties of Panjáb maize. It is to be regretted that space cannot be afforded to bring together in a similar manner the answers to all Colonel Wace's questions. A *précis* of a few other facts may, however, be briefly attempted, namely, on the seasons of sowing and reaping; the rotation pursued; and the yield.

Seasons of Sowing and Reaping. 123

Two Crops. *Conf. with pp. 330, 337.*

Seasons of Sowing and Reaping.—As might be expected the range of the periods of sowing and reaping is very great. Speaking generally it may be said that in the plains the period of sowing is dependent on the rains to moisten the soil and allow of its cultivation. In such cases it is therefore a *kharif* crop, sowings taking place from June to August (according to local peculiarities), and the crop comes into bearing of green cobs (from the earliest sowings) in August and the ripe grain (from later sowings) in September, October, or perhaps not even until November.

On the hills the sowings are generally much earlier, and the higher reaches are earlier than the lower. Thus, for example, in Hazára, Kullu, and Simla the early sowings are in April and May, but in these cases the crop occupies the field throughout the summer, the land being cleared in autumn to allow of the wheat sowings that lie in the ground throughout winter.

While these are the general principles of the crop, the most remarkable variations occur due to local climatic peculiarities, systems of cultivation, or the nature of the maize crop grown. In some districts, for example, there are two widely different crops that correspond very nearly to the *kharíf* and *rabí* seasons. Thus, for example, in Ráwalpindi (Pindigheb tahsíl) the usual *kharíf* crop comes into bearing in the beginning of August and the *rabí* crop yields its grain in December and January. In Jullunder the grain crop of maize is sown in the beginning of August and reaped in November and December, while the green cob crop is sown in June-July and reaped in September and October. In Kullu the *Sathu* crop is sown in July and the *tandara* in April and May. In Hoshiarpur the best crop is sown in June-July and reaped in September and October, but the green cob crop is sown in March-May and reaped in June-July. In Ludhiána maize appears to be a two-months or at most

a two-and-a-half-months crop, being sown in August and reaped in September and October

CULTIVATION in the PANJAB.

Rotation. 124

for example, are frequently sown between the lines of maize, while the crop is standing. This is specially resorted to in threatened drought. The leaves of the carrots are given to cattle and the roots eaten by the people. On the other hand, *toria*, *kasumba* or gram follow maize in

Yield. 125

Yield.—In the Appendix to the Panjáb special paper on Maize, the reports of the local officers are tabulated under certain headings, such as area irrigated and area not irrigated: colour of grain: description of soil: whether mixed with other crops or not: maximum, minimum and average yield per acre: price per seer; uses of the grain and of the

82 that show 400 seers or over to the acre; 40, with 500 seers or over; 24, with 600 seers or over; 20, with 700 seers or over, and 3 with 1,000

ledge of the total production from surveyed acreage, until the relative extent of the lands that give the acreage has been ascertained. A few acres of high class cultivation might seriously raise the average, while providing only a few maunds to the provincial total production. But it

re those of certain forms of

The former showed 125 seers

is very probably exercise as

average as do the abnor-

(1,332 seers an acre) and the

chitti and *pili* maizes of Fatteh Jang in Rawalpindi which had each 1,350 seers. There were in 1885-86 under these crops with high yield, however, only a little over 13,000 acres, and under those with an abnor-

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Cultivation of Maize

Outturn in the Panjab. Total [illegible] million [illegible]. 125

nally low return about [illegible] acres. Deducting these areas of extremes in yield there would have remained over [illegible] acres as under a normal return of from [illegible] to 900 seers an acre. Thus the Kangra District, which has usually a very large area under maize, showed, in 1889-90, an average of [illegible] seers an acre if the crops that gave [illegible] seers and [illegible] seers be left out of consideration. Hoshiarpur, on the other hand, which has by far the largest area under this crop of any of the Panjab districts, manifested an average of [illegible] seers, or [illegible] an acre. If, therefore, it be assumed that the Panjab normally possesses 1,000,000 acres that yield 900 seers or [illegible] an acre, this would be equivalent to a production of [illegible] cwt. of grain, or, say, very nearly half a million tons.

Practically not exported. 127

The returns show little or none exported from the Province, so that some conception from these facts may be obtained of the value of this crop to the Panjab population of [illegible]. It would, however, be misleading to express this article of food to head of population because, except as a luxury in the condition of green cobs, it is an article of diet with certain communities only. The consumption in the green state does not, however, in the writer's opinion detract from this calculation, since if it did not pay to sell in that stage it would be allowed to mature, and, moreover, it seems likely that a large garden cultivation has not been provided for since a few plants here and there could scarcely have been included in the surveyed maize cultivation. It is, therefore, as it would appear perfectly safe to assume that Indian-corn furnishes annually half a million tons of the food to this Province.

II.—N.-W. PROVINCES AND OUDH

N.-W. Provinces & Oudh. 128

References.—[illegible]

Area. 129

Area.—The total area under crops in these Provinces in 1889-90 has been shown in the Agricultural Returns as [illegible] acres in the North-West and [illegible] acres in Oudh, or a total of [illegible] acres. Of that large productive region [illegible] acres were maize. The cultivated acreage of the Panjab by way of comparison, was [illegible], of which it has been calculated about 1,000,000 are normally under this crop. It will thus be seen that in relation to the extent of these Provinces, the Panjab may be regarded as more especially the maize-growing country, but the North-West Provinces, Oudh, and the Panjab conjointly afford India's maize fields.

India's Maize area. The Panjab & N.-W. P. 130

The whole of the other Provinces do not very possibly possess very much more than [illegible] to 2 million acres as under this crop. In the North-West Provinces it may be said to be cultivated everywhere except in Bundelkhand in which it is very little grown. It

CULTIVATION in the N.-W. P. & Oudh.

reaches its maximum in Gorakhpur and Basti. The area fluctuates greatly from year to year, and without any apparent reason it is a favourite crop in one district, and little grown in a precisely similar and perhaps neighbouring district.

Although the writer has before him the very extensive series of papers quoted in the above paragraph o
much information has been brou
Messrs. Duthie & Fuller's *Field*
suffice to give some of the leading
tion of the methods of cultivation, varieties of maize grown, and yield, etc., etc.

Varieties. 131

Varieties cultivated.—"So far as the colour of the grain is con-
ie cobs may be of any tint from
orange, to a pure white But
in Jaunpur and Azamgarh, in
which the cobs are of double the usual length, and the plants of taller growth than the ordinary. The grain of this variety is, however, nearly a month longer in maturing."

Seasons of Sowing & Reaping. 132

Seasons of sowing and Reaping.—"Maize is a *kharif* crop and ranks next after broadcasted rice in the rapidity with which it comes to

One Crop 133

Mixed Crops. 134

a little pulse (*urd*), since these require but little more time to ripen and secure some measure of return in the not uncommon case of the maize completely failing."

Thatch. 135

"If the cobs are to be sold as vegetables they are pulled while green and the stalks in that case are of some use as cattle fodder. Otherwise the cob is not harvested until the leafy envelopes surrounding the cobs are dry and shrivelled, when the stalks are so hard and desiccated as to be almost useless for any purpose but thatching. The cobs may either be pulled by themselves and the stalks left standing in the field until there is
with the cobs on them and
the grain is to be separated
k is a slow and troublesome
separately, forcing the grain
l When the cobs are per-
lly performed by beating a
tread ng the grain out by
-half to two-thirds of that of
promise well, the stalks are
since the maize stalk when
nount of saccharine matter

Green Fodder. 136

Cultivation of Maize

CULTIVATION in the N.-W. P. & Oudh.

Yield. 137

Yield.—"The general average outturn for the Provinces may be taken as 10 maunds for unirrigated and 14 maunds for irrigated maize. The Settlement Officers of Bijnor and Aligurh arrived at averages of $7\frac{1}{2}$ and $10\frac{1}{2}$ maunds, respectively, while the careful experiments of Mr. Moens in Bareilly give $15\frac{1}{2}$ maunds for manured land, 12 maunds for unmanured land, and $12\frac{1}{2}$ maunds as the general average for the district. In both Etawah and Cawnpore the average outturn is returned as 12 maunds."

Messrs. Duthie & Fuller furnish no particulars regarding Oudh, but there is no reason for thinking that the system of cultivation and the results obtained differ in that Province in any material respect from the North-West. It will also be noted that the outturn in these Provinces (ascertained by Messrs. Duthie & Fuller) correspond very closely with that which the writer has worked out above from the numerous recent returns of the Panjáb. If, therefore, a yield of 500 seers an acre be accepted as a fair average, these Provinces, from the acreage of 1,454,689, may be assumed to have given an outturn of 12,988,295 cwt., or 649,414 tons. There is no indication of more than a district to district exchange. The exports from these Provinces must be very small indeed, so that it may safely be concluded that this plant which, little more than a century ago was a garden crop, affords to-day over 1,000,000 tons of food annually to the people of the North-West Provinces, Oudh, and the Panjáb.

Outturn 649,414 tons. 138

No Exports to speak of. 139

BOMBAY. 140

III.—BOMBAY.

References —*Gazetteers:—III., 45,232; IV., 53; VI., 39; VIII., 182, 188; XII., 137, 149, 151; XV., Pt. II., 18; XVI., 91; XVIII., ii., 35, 38; iii., 76, 96, 99; XIX., 160, 163; XX., 229, 395, 399, 403, 405; XXI., 247; XXII., 273; XXIII., 319; XXIV., 156, 164, 167; Settlement Reports:—(South Division), I., (1874-75), 54; (1875 76), 89, 109 133, 153, 176; (1876-77) 35, 41, 53, 57, 69, 85, 97, 113, 124, 126; (1877-78), 45, 56, 57, 59, 70, 71, 73, 85, 86, 89, 101-104; II. (North Division) (1876-77), 87, 99, 113, 119, 127, 151, 170, 171, 173, 186 (1877-78), 53, 65, 79, 87, 95, 107, 119, 127, 154, 155; (Central Division) (1877-78), 79, 91, 103, 117, 131, 145, 157, 158; V., (Kalol Taluk, Panch Mehals), 8; (Anklesar), 20, 37; VI., (Ahmednagar), 171, 174, 204; (Sholapur), 413; VII. (Haveli Taluk, Poona), 402; VIII. (Khandesh), 127; IX. (Omercote and Narra, Sind), 51; Agricultural Reports:—(1884-85), 18; (1885-86), 6; 1886-87), vi; (1887-88), vi; (1888-89), vi, xviii; Bomb. Man. Revenue Accounts, 101; Useful Plants Bombay, (vi, XXV., Bomb. Gaz.), 186, 208, 375; Statistical Atlas, Bombay Presidency, 7.*

Area. 141

Area, Outturn, etc.—It has already been stated that, according to the Agricultural Returns for 1890-91, the acreage of this crop in Bombay and Sind came to 137,457. It is, therefore, a very much less important crop in these Provinces than in the North-West and the Panjáb. The systems of cultivation do not appear to differ very materially from what has already been detailed, so that it may suffice to convey an idea of the crop to furnish the brief note given by Mr. Ozanne in the Statistical Atlas:—

"*Makkai* (Guj.), *Maka* (Mar.), *Goinjol, Mekkejol* (Kan.) is chiefly cultivated in the Panch Mahals, where it ranks as a staple. Sátára and Sholápur grow a good deal, and in the Deccan it is mostly grown for early fodder, though the grain is allowed to ripen and the ears are readily sold in towns for roasting. Some success has been secured in Ahmadnagar with the American seed. It is a four-month crop and in the Panch Mahals is followed by wheat or gram. In this district maize is the early crop in light sandy lands, but in heavier land rice and maize are equally important, and both are followed by wheat or gram. The late crop seldom covers as large an area as the early one. It is confined principally to the portions of the field most retentive of moisture from position or depth of soil. The maize stock is a good fodder, especially when eaten green as soon as

Fodder. 142

Two Crops. 143

the ears have been plucked.

in March or April and reaped in May and June. the late crop sown in June and reaped in November.

Seasons of Sowing & Reaping. 144

IV.—CENTRAL PROVINCES.

CENTRAL PROVINCES. 145

References.—*Settlement Reports*—*I., (Chanda), 80-83 (Upper Goda-*

Statement of the Agricultural Statistics of India these provinces (in 1890-91) had 106,659 acres under the crop. Although this cultivation is briefly alluded to in many of the Settlement Reports and other such local publications, no detailed special report has as yet been published. The

Area. 146

Experiments. *Conf with pp. 349, 336-7, 340.*

of the agriculture of these provinces from the scattered and

Two Crops. 147

state, and the late to some extent employed in the preparation of flour used by the poorer classes, or the ripe grain is simply parched and eaten in that state. Thus, for example, Mr. Morris (*Descript. and Hist Acc Godavery, p. 90*) says that the Kois make a kind of porridge called *java* out of this grain. In another passage he remarks that there is both a *kharif* and *rabi* crop, chiefly the former.

V.—MADRAS.

MADRAS. 148

References.—*Man. Madras Adm, I, 288; Man. of Kurnool, 167, 269, 274; Boswell, Man. Nellore, 403; Gazetteer Nilghiri, 475, 479, North Arcot, 331; Salem, I., 148, Account Godavery District by Morris,*

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portance

a plant of garden rather than of field cultivation. According to the Agricultural Returns of 1890-91 there would appear to have been only

Area. 149

ment which purports, apparently, to be applicable to the whole of India. He says: "It is not much cultivated in India as a field but as a garden cultivation, small quantities have been grown from time immemorial in most parts of India" It is perhaps scarcely necessary to remind the reader that there are perhaps five million acres annually under maize as

ZEA Mays.

Cultivation of Maize

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a regular field crop and that far from its having been grown "from time immemorial" in this country it would be safer to say that it has only recently been introduced. As a field crop it has probably not existed more than a century and very probably was originally brought to this country about the middle of the sixteenth century. But to revert to Shortt's essay on maize "The best varieties of maize when well cultivated is very productive and its value as human food is well known, being considered superior to rice and other dry grains of India. An acre in a good soil will produce 1,500 to 2,000 pounds of corn without any particular care being given to the plants and furnish 2 to 3 tons of fodder rich in saccharine matter and proves a valuable fodder for cattle and horses." "Four varieties are commonly met with in various parts of India; the large eared, small seeded pinkish, red eared and small grained black corn. The large white eared variety is the best and most largely produced, the others appear more the result of accident and are only occasionally found among the others." It does not seem necessary to continue quotations of this character as the article so far appears to have no bearing on India. Further on, however, when Shortt left the field of general compilation, and took to actual facts with which he was familiar, he furnished a few local particulars. These are distinctly of interest and are therefore worthy of a place in a notice of the maize cultivation of South India. "I have seen, he says, Indian-corn as a garden culture growing in most out-stations in South India and have also grown it myself. About a mile from Vellore on the great western trunk roadside, is situated a village called Totta Pállium, where Indian-corn is grown as a field culture on the same grounds year after year on rather a large scale. These fields can be seen distinctly from the roadside as they are located in a valley immediately below the road; some portions of the cultivation are irrigated and others not. The corn stalks attain from 8 to 10 feet in height and the produce of each varies from 3 to 5 cobs. It grows remarkably well at Palmanair and produces largely; two of the best cobs, I have ever seen, were grown at Palmanair, one was 12 and the other 10 inches long and covered from end to end with good sound seed; on another I counted 600 corn grains, and that was by no means a picked cob. Indian-corn grows well in most districts and produces 3 to 4 and sometimes 5 cobs on each stalk, the average is 2 cobs per plant." Shortt then continues with a long and detailed report by Mr. W. Robertson, Superintendent of the Government Experimental Farm of Sydapet, on the experiments with Queensland maize under dry cultivation. These and such like experiments the writer considers it desirable to exclude from consideration in this work. The object aimed at here is to try and bring together as much purely local information as possible, within the available and limited space. While not entirely disapproving of experiments at acclimatisation on a large scale (if funds can be provided for these) the writer does not think the results have as yet assumed the position of definite value to India. That being so, there does not appear any pressing necessity to publish either the failures or the successes. Speaking broadly, however, the conviction arrived at by the writer, while working up the material for the various volumes of this work, may be said to be that the successes attained in India in the acclimatisation of foreign animals and plants have been very much less than has been accomplished in other countries by natural selection alone. It would accordingly appear more urgently necessary to turn attention to the existing forms of maize and to try and improve these, rather than to waste the entire energies and available funds of the agricultural reformers in the more or less fruitless effort at acclimatisation of the triumphs of the agriculture of other countries.

Yield. *Conf. with p. 349.*

Varieties said to be met with.
150

Acclimatisation and the results obtained.
151
Conf. with pp. 329, 336-7, 340, 347.

CULTIVATION in Madras.

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confirmed. "*Mokka-jonora, mokka, buta* has become a regular crop

high class methods pursued at the experimental farm, assumes a very different position when advanced as Shortt appears to desire, as the usual Indian return on a "good soil" The writer believes 1,000℔ an acre of grain the highest average that can be accepted for all India, though in some of the returns he has consulted an yield of 2,500℔ is

Outturn. 152

VI.—BENGAL.

BENGAL. 153

Lohardaga, I., 13, 50, 51, 65-67, 152, 153, II., 24, 25, 28, 54, 61, 73, 74

Area, etc.—Indian-corn is not cultivated to the same extent, nor indeed has it obt

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conditions, is of necessity an independent problem. During a century or more of maize cultivation in Lower Bengal, special forms have been evolved suited to the climate, the nature of cultivation, and the requirements of the people. Were it, therefore, contemplated to attempt the im-

Adaptation to conditions. 155

Reckless experimenting 156 *Conf. with pp. 329, 336-7, 340, 347.*

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CULTIVATION in Bengal.

green cobs; (2) the cultivation as a staple food grain on the hilly tracts, such as in Chutia Nagpur; and (3) the cultivation in Behar which differs in no essential from that in the greater part of the North-West Provinces. All experiments towards improvement should bear these three widely different cultivations in view. An exchange between Madras and Lower Bengal would be more hopeful than between Behar and the Lower Provinces. So, again, interchange between the hilly tracts of the Central Provinces, or even the Himalaya might result in more good to the Chutia Nagpur maize than any other experiments that could be tried. Bengal, it may be said, is infinitely less suited for experiments at acclimatising foreign maize than any other part of India. If it be desired to obtain a foreign strain this should alone be looked for from the successes attained in other parts of the country.

In Bengal, taken as a whole, maize can hardly be regarded as of great moment. It is, in fact, among the hill tribes alone that it can be said to rank as a staple article of diet. Its importance in India may safely be gauged by the extent to which the crop is grown for its ripe grain and by the use of maize flour. In Lower Bengal as a whole, the ripe grain and flour might almost be said to be unknown. The crop is produced almost entirely for its unripe cobs, and the forms of the plant suitable for such cultivation differ in many respects from those grown for ripe grain.

The following account of maize cultivation, in a section of Chutia Nagpur, may be accepted as fully expressive of the system pursued by the hill tribes of the Lower Provinces:—

Lohardaga. 157

LOHARDAGA.—"Two varieties are usually distinguished, *viz.*, a dull yellow coloured variety, and a red or *lálká* variety. The first variety is in common cultivation. When the grains are not properly filled or matured, they have a whitish appearance. The grains of both the varieties are thin and small in size. In respect of time of sowing, cultivation, etc., the two varieties named above do not differ from each other.

"Maize is cultivated by almost every *rayat* in a small plot of *bari* or homestead lands. It requires a rich soil and will not grow in outlying upland." "Although cultivated in every village, it occupies a small area as compared with the other cereals of Chutia Nágpur. In jungly tracts, however, maize is looked upon as only inferior in point of importance to paddy." "Maize is usually grown for two or three successive seasons on the same *bari* plot and followed by some cold weather crop like mustard; but as it refuses to grow well on the same land for successive seasons, it is the practice with *ráyats* to take a crop of some other *Bhádoi* crop like *cárai* or *márua* every third or fourth year, as the case may be.

"In *Asár* (June-July) after the soil has been well moistened by a shower of rain, the land is ploughed three times over, and the clods, if any, broken by passing the harrow over it. The seed is then sown broadcast at the rate of 4 or 5 seers per acre. Grains are rarely dibbled in, which is a better but tedious practice, and the small saving of seed is not enough to make up for the extra labour of dibbling. A poor *rayat* having a small quantity of seed is found here and there to economise it by dibbling the grains in at intervals of a cubit from one another. After the seed has been broadcasted, it is buried in by a light ploughing and the soil then levelled by the harrow. When the plants have come up about 4 inches high, all grasses and weeds are picked up by the hoe, which also works the soil about 3 inches deep; at the same time where the plants have come up too close to each other, the superfluous among them are spudded out and thrown away. The land is thus weeded and hoed two or three times in all during *Asar* (June-July) and *Sravan* (July-August).

"The flowers come up in the second half of *Sravan* 1st, to 15th August. Two cobs are usually formed on each plant; of these one is properly filled and the other generally empty. The cobs ripen in early *Bhadra* (15th August—15th September), but when eaten raw or after being roasted (as is usually the practice with the people), they are available a fortnight before the time of ripening. They are simply picked off the plants, and after being dried the corn is beaten out with a stick. It requires

or Indian-corn in Bengal. (*G. Watt.*) ZEA Mays.

to be further dried in the sun, otherwise it is liable to grow musty, when kept in close damp places. The stems are left on the ground or are gathered and burnt ... Yield 5 maunds an acre. 158

Palamau. 159

Yield 6 maunds an acre. 160

... ne ... ed ... he ... ur ... of ... *a.* Hazaribagh. 161

... gives a very extensive glossary of the names in use in this province for Indian-corn (the field crop, the grain, the unripe cobs, the spathes, the fodder, etc., etc.). The most general name for the plant is, he says, *makai* or *makaiya*, but it is also called *janera, junera*—names that more properly belong to the large ... *kthail* for the ... empty spike ... The sheath ... ale flowers is called *bhanbal* or *bhanahra* ... Behar. 162

... ghout the Province—a ... the crop it would be ... ated to specifie signifi- ... ese names are not only adaptations to modern necessities, but some of them, such as *makai* and *Conf. with pp. 327, 333, etc.*

ZEA Mays.

Dieases of Maize.

CULTIVATION in Bengal.

bhutta occur in every dialect and tongue throughout the length and breadth of India.

Gaya and Shahabad. 163

Of GAYA and SHAHABAD districts it may be said maize is sown at the commencement of the rainy season and cut up at the end. In an estimate framed some few years ago it was announced that the two crops of maize represented an area of 80,000 acres and yielded 2,40,000 maunds of grain. The early crop is generally transplanted and it yields a very considerable portion of the food of the poor classes. The grain is often made into *satú*. The stems and leaves are employed as fodder. On these being gathered the land is irrigated and prepared for its winter crop.

Sandarbans. 164

SANDARBANS & 24-PARGANAS.—In the Statistical Account of Bengal (*Vol I., 139*) a brief notice occurs of the Indian-corn of these districts, which may be said to fairly represent the conditions that prevail in the Lower Provinces generally. *Bhuttá* or *janár* is grown to a small extent only, though nearly every well-to-do peasant has a small patch. It is sown in May and reaped in September, the cobs being eaten in the green state.

DISEASES OF MAIZE.

DISEASES. 165

The replies obtained from the District Officers of the Panjáb, to a circular letter on Maize (already freely drawn upon), afford by far the most extensive and useful information hitherto published on the PESTS & DISEASES of this crop. Unfortunately, while these replies speak of the injury done, the diseases are alluded to under native names, and it is often impossible to discover whether a certain disease is fungoid or insect, or whether that spoken of in one district, is the same or different from a disease dealt with in connection with another. While it is thus impossible to furnish in this place more than a general statement, it may confidently be affirmed that the injury done is frequently of such serious consequence as to justify a scientific investigation in the future.

Too much rain and too much sun injurious. 166

Maize does not appear to flourish under too much rain nor too continuous sun-shine. Thus of Gurdáspur it is said: "If there are deficient rains, the stalk does not bear any cobs; and if the rains fail and the land cannot be irrigated at the time that the plant is about to produce cobs, the cob is found to have grain only in a portion of it. If, on the other hand, there are excessive rains at that time, then the stalk grows to a great height, and it does not bear cobs, or if any, the cobs are of an inferior kind, the grain is small, and the produce little." With late sowings the plant stands a chance to be unable to ripen its grain from want of sun, or to be destroyed by frost or hail.

High winds destructive. 167

High winds also do great damage and in consequence districts liable to such visitations have by natural selection developed a form of the crop, which, while inferior in some other respects, has the advantage of being able to withstand sudden gales. Other forms possess the property of enduring a fairly protracted drought and of reviving again and yielding a fairly good crop on being irrigated artificially or naturally.

Selection of properties to withstand above dangers essential. 168

So, again, natural selection has produced forms of the plant suitable in other respects to district requirements such as those that can mature grain within a certain limited period of favourable weather. Such then are the climatic considerations that must be borne in mind in the study of the maize crops of India or when it is contemplated to attempt the substitution of new qualities.

Enemies. 169

But there are enemies and pests to the crop that are often of very serious moment. The maize fields have to be carefully fenced when young, to protect them from domestic or wild herbivorous animals, and later on when the cobs appear watchmen have often to be stationed in the fields night and day to ward off the bears, jackals, dogs, pigs, monkeys, porcupines, rats, squirrels, and birds that would otherwise effect frightful depredations.

The following jottings from the letters alluded to above seem to denote INSECT PESTS:— DISEASES. INSECT PESTS. 170

AMRITSAR.—"Maize crop is liable to *tela*, a small sized worm or insect; *sundhi*, a large worm (insect) which eats up the cob"

HAZÁRA.—"Maize is subject to the attacks of grubs, especially in dry weather."

mak) attacks the plant sometimes."

ung shoots come up, a small hairy s, and frequently does much harm in appears after 10 or 12 days The damages the young shoots. There is an earth worm, called *garuna* or *gut*, which destroys the roots; and in dry weather white-ants also attack the roots"

JULLUNDAR.—"In its early days maize may suffer from caterpillars (*sundhi*)."

PESHAWUR.—"White caterpillar (*Pishakai*) eats the young stalks. Red caterpillar (*changu hangu*) eats the young leaves White caterpillar (*spin chinjai*) feeds on the cobs."

KARNÁL.—"If there is not seasonable rain soon after the plant has germinated, the young sprouts are eaten by an insect called *phirka*."

KOHÁT.—"*Chinji* or the "worm" is a white insect from half to three quarters of an inch in length; when there cy of rainfall plant withers

t as yet ap- FUNGOID DISEASES. 171
erence to the
rust, which do so much damage in other parts of the world, also occur in India. The former, being more striking than the latter, has been observed by many writers; but we are indebted to the late Surgeon-Major Barclay for particulars regarding rust.

1st.—SMUT (Ustilago Maydis) is a remarkable disease It attacks Smut. 172
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e writer once attempted to count the number of affected plants in a field a little below

grain sown by him.

Ustilago carbo, the smut, so prevalent on Sorghum, has been recorded as seen on the male inflorescence of maize The reader might consult the remarks on smut that will be found under Sorghum vulgare, *Vol. VI., Pt. III.* 173

2nd.—MILDEW or RUST (Puccinia Sorghi, *Schw*). In an interesting paper in the *Journal of the Asiatic Society of Bengal* (July 1891), p. 214, Mildew. 174
seen by
ave been
c.), but
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Z. 174

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HAZÁRA.—"Maize is subject to the attacks of grubs, especially in dry weather."

GURDÁSPUR.—"The white-ant (*dimak*) attacks the plant sometimes."

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KARNÁL.—"If there is not seasonable rain soon after the plant has germinated,

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it attacks the early sown maize at the root, on which the plant withers away soon after."

Fungoid Diseases.—Although scientific papers have not as yet appeared on the fungoid diseases of this crop, with a special reference to the extent of the injury done, it is well known that Smut and Rust, which do so much damage in other parts of the world, also occur in India. The former, being more striking than the latter, has been observed by many writers; but we are indebted to the late Surgeon-Major Barclay for particulars regarding rust. FUNGOID DISEASES. 171

Smut. 172

puff-ball of black powder. Few fields of maize can be seen in India without a large percentage of the plants so affected and the crop largely destroyed thereby. The late Surgeon-Major Barclay and the writer once attempted to count the number of affected plants in a field a little below Simla. We arrived at the opinion that in that particular case well on to

as seen on the male inflorescence of maize. The reader might consult the remarks on smut that will be found under Sorghum vulgare, *Vol. VI, Pt. III*. 173

eresting Mildew. 174

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c.), but

the chief point may be here recapitulated, *viz.*, the rust on Sorghum in

ZEA Mays.

Trade in Maize.

DISEASES. India is not Puccinia Sorghi, while that disease appears in this country on a new host, *viz.*, Zea Mays.

Having thus briefly indicated the two chief fungoid diseases which are known to attack the maize crop of India, a few passages may be furnished from the Panjáb reports that would seem to relate to these or other fungoid diseases.

175 HAZÁRA.—"The most fatal disease to maize is *jhal* or *channi*, which causes the stalks to dry up. Excessive moisture brings this on."

176 JULLUNDAR.—"Is subject to a disease called *ukherá*, in which the roots dry up."

177 KOHÁT.—"*Channi*, Dew-fall —Towards the end of autumn the dew-fall in places shut in by the hills is excessive, and the crop when attacked by it is completely destroyed. In such places, therefore, even at the risk of obtaining a poor crop, maize is sown earlier than elsewhere, so as to be harvested before the dew-fall comes on." "*Spinki*—This disease is common to both the tahsils (Kohát and Hangu) and generally attacks the crop when the cobs are being formed. The stalks thereupon shrivel up and become white or yellowish, and little or no grain is formed on the cob." "*Tilli*—This disease is peculiar to the Hangu tahsil. It attacks the crop during the rains between the 30th June and the 15th July, when the plants are young, and is popularly supposed to be due to the heat engendered in the rain water, which has passed over waste and barren lands."

178 LUDHIÁNA.—"When the crop is ripening, damage is sometimes done by a sort of 'Smut' called *sundi* which destroys the stalks."

179 KULLU.—"The crop is liable to Mildew known as *buka*, if rain does not fall soon after the sowing, and to another disease called *arni*."

TRADE. 180

TRADE IN MAIZE.

Neither the Annual Statements of the Foreign Trade of India nor the Returns of Internal Rail, Road, and River Traffic show Maize. It is believed that India practically exports no maize to foreign countries, and that the internal transactions are shown along with those of millets. The statement made by several writers that India exports Indian-corn and has again to import the corn-flour she requires, instead of making corn-flour locally, is not, strictly speaking, correct. India, in fact, imports only the small amount of corn-flour required by the European residents, and the great bulk of the maize grown in this country is of too poor a quality to be utilized in the manufacture of that article. That India might, however, do a considerable traffic in the supply of maize to be used as cattle food seems likely; but whether it would pay to carry so low priced a grain such distances by land and sea as would be necessary seems highly problematic. India could easily increase her area of maize production were it possible to compete in the European supply, but so far as is presently known maize is purely grown for local consumption, and each district appears very nearly to produce its own supplies. There is at all events a much smaller provincial exchange in this grain than with any other article of food. If we assume an average production of 500 seers per acre, and accept the estimate that the normal total area under this crop is 5,000,000 acres, then it would appear that there would be produced 44,642,857 cwt. or 2,232,142 tons of this grain. This estimate must not, however, be accepted as including the cultivation necessary for the production of the cobs that are eaten in the green state. Maize might almost be said to be grown in every garden in India, and the sale of green cobs to city communities is one of the most profitable branches of market gardening. It will thus be seen that maize, although possibly the most recently introduced food crop, is by no means the least important article of food to the people of India.

Total Production. 181

The Black and Yellow Zedoary. (J. Murray) ZEUXINE sulcata.

(J. Murray.)

ZEHNERIA, Endl.; Gen. Pl., I., 830.

Zehneria umbellata, Thw.; Fl. Br. Ind., II., 625; CUCURBITACEÆ. 182

lon
máon, and Kunawar.

Medicine.—Dymock writes, "Its medicinal properties do not appear to be generally known to European writers on Indian Materia Medica, nor does it appear to have had a place in the Sanskrit Materia Medica MEDICINE. Juice. 183 Root. 184 Leaves. 185

cine, roasted onions, *gometta* root, cummin, sugar, and *ghí* are given, or *gometta* only with milk and sugar" (*Mat. Med. W. Ind.*). [The reader might consult the remarks that have been made regarding this plant under Podophyllum emodi, Vol. VI., 305.—*Ed., Dict. Econ. Prod.*]

Food.—"The ripe and unripe FRUIT are eaten by the Natives, as are also the ROOTS when boiled" (*Roxb. Campbell*). In Bombay the fruit is FOOD. Fruit. 186 Roots. 187
Linn., on *duadashis* which
re invariably associated in

Zedoary, Black, see Curcuma cæsia, *Roxb.*; SCITAMINÆ, Vol. II., 658.

Zedoary, Yellow, see Curcuma aromatica, *Salisb.*; SCITAMINÆ, Vol. II., 65.

ZEUXINE, Lindl.; Gen. Pl., III., 599.

Zeuxine sulcata, *Lindl.*; *Fl. Br. Ind*, VI., 107; ORCHIDEÆ. 188

[illegible]

ZINC. [illegible]

[illegible] (Ball.) [illegible]

[illegible] by Mr. Wallace in great abundance disseminated through [illegible] the antimony ore which occurs there" (Ball). "It has also been obtained from [illegible] in Garhwal, in the [illegible] and from some uncertain locality in Kashmir" (Mallet). "In the

Z. 234

Sirmur-Jaunsar mines a distinct string of ore occurs, which consists of zinc blende, with some galena, iron pyrites, and quartz" (*Medlicott*) LOCALITIES

5. AFGHANISTAN.— ...
near the Ghorband v... ...n.
efflorescence of zinc sul...
was employed for any purpose, medicinal or otherwise, is not stated" (*Ball*).

6. BURMA —According to Dr. Mason zinc ore occurs in Tavoy; the same authority records that Dr. Helfer had obtained an ore of the metal in one of the Mergui islands. Nothing is known as to the occurrence of zinc in Upper Burma. Burma 196

Medicine.—"Zinc is not mentioned by the older Sanskrit writers such as Susruta, nor does it enter into the composition of many prescriptions The *Bhávaprakása* mentions it in the chapter on metallic preparations, and directs it to be purified and reduced to powder in the same way as ... in eye diseases, urinary disorders, ... A crude oxide and silicate of the ...ioned in most Sanskrit works, and ...umber of prescriptions both for internal ... alterative, and useful in skin- ... several compounds containing ... f *kharpara*, goldleaf, pearls, ..., is said to be "much used by ... secondary syphilis, chronic gonorrhœa, leucorrhœa, etc." Ainslie states that Muhammadan physicians in India use impure calamine (an oxide and silicate, or carbonate of zinc) for nearly the same purposes for which it used to be employed in England, namely, as a dry application to excoriations, ulcers and superficial inflammation. ... cians did not, in h... Tamils used it freely... crucible, adding so... constantly stirring th... way, and the resulti... served for medicinal use ... by the Native practitioners "wi... œa, spermatorrhœa, "fluor albus, ... ther salts, the value of which is well known in European medicine, are now employed to some extent by the better informed class of Native practitioners. MEDICINE 197

Arts.—In British India zinc is chiefly used in making alloys. Of these the alloys with lead are chiefly employed on account of the facility with which they can be turned or filed, those with copper for their ductile properties, or for making pot-metal, a combination which is brittler when warmed. The many uses of the metal in the arts in Europe are too well known to require description. ARTS. 198

ZINGIBER, *Adans.; Gen. Pl., III, 646.*

Zingiber C... 199

..., *t. 13, Rumph., Amb., V., t. 64; U. C. Dutt, Mat. Med. Hind.*, ...

255, 322; *Dymock, Mat. Med. W. Ind.*, 2nd Ed., 764; *Year-Book Pharm.*, 1880, 251; *Atkinson, Him. Dist.*, 318; *Birdwood, Bomb. Pr.*, 88; *Agri-Horti. Soc. Ind., Journ. VII.* (*New Series*), *Pro.* (1885), *cxii.*

Habitat.—A native of various parts of India (*Roxb.*), Coromandel, the Konkans, Behar, Bengal, and Sylhet (*Voigt*), rare in Ceylon (*Thwaites*). It flowers in July and August and fruits in November and December.

MEDICINE. Root.
200 **Medicine.**—"The ROOT of this plant Sir Joseph Banks and Dr. Combe think the true *Cassumunar* of the shops. When fresh it possesses a strong camphoraceous odour, and warm, spicy, bitterish taste; when dried considerably weaker" (*Roxb., Monand Pl.*). Though used medicinally by the Natives, it appears never to have been an article of commerce in India; but is said by Mr. Colebrooke, President of the Asiatic Society, in a note on Roxburgh's account of the plant, to have been first introduced into European practice by Marloc, "as a medicine of uncommon efficacy in hysterick, epileptick, and paralytick disorders; but is gone out of repute." At the present time it has a similar reputation in Indian practice to the officinal ginger, and in the Konkans is considerably used as a carminative stimulant in diarrhœa and cholera (*Dymock*).

201 **Zingiber officinale,** *Roscœ; Fl. Br. Ind., VI.*, 246.

Syn.—AMOMUM ZINGIBER, *Linn.*

Vern.—Plant=*adrak*, dried root=*sónth, sindhí*, fresh root=*adrak, adhruka*, HIND.; Plant=*ádá*, dried root=*sónt*, fresh root=*ádrok, adá*, BENG.; Plant=*ádá*, ASSAM; Dried root=*Sünt*, NEPAL; Plant=*adá*, URIYA; Plant=*ada*, dried root=*adrak*, fresh root=*sonth*, N.-W. P.; Plant=*ada, adrak*, dried root=*zangzabil, sonth*, fresh root=*zunjbel, adrak*, PB.; Dried root=*sónt*, fresh root=*adrak, adhruka*, DECCAN; Plant=*ádu, ále*, dried root=*sont, sunt, sunta*, fresh root=*alen, alem, alch, adrack, adu*, BOMB.; Plant=*álé*, MAR.; Dried root=*súnt*, fresh root=*ádú, adhú*, GUZ.; Dried root=*shukku*, fresh root=*inji*, TAM.; Plant=*allam*, dried root=*sonti, sonthi, allam*, fresh root=*allam*, TEL.; Dried root=*vana-sunthi*, fresh root=*hasisunthi*, KAN.; Dried root=*chukka*, fresh root=*inchi*, MALAY.; Plant=*khyen-seing*, dried root=*ginsi-khiáv*, fresh root=*gin sin*, BURM.; Dried root=*velicha-nguru, inguru*, fresh root=*amu-inguru*, SING.; Plant=*árdraka, sringavéra*, dried root=*vishva-bhishagam, nágara, sunti, mahaushadha*, fresh root=*árdrakam*, SANS.; Dried root=*zanjabil, zanjabile-yábis*, fresh root=*zanjabíle-ratab*, ARAB.; Dried root=*zanjabile-khushk*, fresh root=*zanjabile-tar*, PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C.*, 16; *also Monandrous Pl. in Asiatic Researches, XI.*, 345; *Voigt, Hort. Sub. Cal.*, 561; *Stewart, Pb. Pl.*, 239; *Graham, Cat. Bomb. Pl.*, 207; *Mason, Burma & Its People*, 803; *Sir W. Elliot, Fl. Andhr.*, 13, 169; *Rheede, Hort. Mal., II., t.* 12; *Rumphius, Amb., V., t.* 66, *f.* 1; *Pharm. Ind.*, 228; *Flück. & Hanb., Pharmacog.*, 635; *U. S. Dispens.*, 15th Ed., 1156; *Ainslie, Mat. Ind., I.*, 603; *O'Shaughnessy, Beng. Dispens.*, 647; *Irvine, Mat. Med. Patna*, 93; *Moodeen Sheriff, Supp. Pharm. Ind.*, 262; *U. C. Dutt, Mat. Med. Hind.*, 253, 291; *S. Arjun, Cat. Bomb. Drugs*, 142; *K. L. De, Indig. Drugs Ind.*, 124; *Murray, Pl. & Drugs, Sind.*, 21; *Bent. & Trim., Med. Pl., t.* 270; *Dymock, Mat. Med. W. Ind.*, 2nd Ed., 762; *Cat. Baroda Durbar, Col. & Ind. Exhib., No.* 186; *Year-Book Pharm.*, 1873, 112; 1879, 426; 1881, 393; 1882, 173; 1886, 156; *Macleod, Med. Top.*, *Bisnath*, 16; *Birdwood, Bomb. Prod.*, 231; *Baden Powell, Pb. Pr.*, 298, 379; *Drury, U. Pl. Ind.*, 455; *Atkinson, Him. Dist.* (X., *N.-W. P. Gaz.*), 706, 734; *Useful Pl. Bomb.* (XXV., *Bomb. Gaz.*), 174; *Econ. Prod. N.-W. Prov., Pt V.* (*Vegetables, Spices, and Fruits*), 25, 34; *Bidie, Prod. S. Ind.*, 17, 88; *Cat. Col. & Ind. Exhib., Raw Products, No.* 121; *Tropical Agriculture*, 481; *Linschoten, Voyage to East Indies* (*Ed. Burnell, Tiele, & Yule*), *II.*, 7, 79, 80; *Milburn, Oriental Commerce* (1825), 288; *Buchanan, Journey, through Mysore & Canara, etc., II.*, 209, 507; *Gribble, Man. Cuddapah*, 200; *Note on the Condition of the People of Assam, App. D*; *Morris, Descriptive & Historical*

12; VII., 87; VIII., 192, 193, Journ. (Old Series), I., 102; II., Sel., 323; IV., 229; IX., 395; X., 341; (New Series), II., Pro., 1870, 41; Tropical Agriculturist, 481.

state, but is doubt-
ltivated and export-
uced into the West
West Indies it has
s, a small portion of

History.—According to Fluckiger & Hanbury the Sanskrit name *Sringavera* is probably derived from the Greek Ζιγγίβερι, but much more probably the Greek was derived from the Sanskrit, which is a very old name, through the Arabic *Zanzabil*. The drug was known to the Greeks and HISTORY. 202

imported during the middle ages and regarded as a delicacy of the choicest kind.

HISTORY

was probably identical with the *colombino* mentioned above). He describes the methods of cultivation and preparation, which appear to have then been very similar to those now pursued. Regarding the trade he writes: "There is much shipped as well to the Red Sea as to Ormus, Arabia, and Asia, but little for Portingale, because it will not save ye freight and custome, onlie the gunner of the Indian shippes may lade and bring certain quintals without paying any customes which by the King of Portingale was of long tyme granted unto them, and is yet observed; and this they may sell to merchants, and so by this meanes there is some broughte, otherwise but very little, for that the most part of Ginger broughte into Spain, cometh from Cabo Verde, the island of St. Thomas, Brasilia, and the island of S. Domingo in ye Spanish Indies, which is much trafficked withall in Spaine; wherefore that of the Portingale Indies is little brought out of the country, because of the long way and great charges, and yet it is better than other ginger; as also all other spices, mettals and stones, that are brought out of the Orientale Indies, that is out of the Portingales Indies, are for goodnesse and virtue better than any other which the continuall traffiques hath sufficiently made known. There is likewise much ginger conserved in sugar, which cometh out of the countrie of Bengala, but the best cometh from China, it is verie good to eate, and much used in India and brought out of Portingale into these countries." The remark on the effect of West Indian competition in diminishing East Indian trade at that early date is of interest, and testifies to the large extent to which the cultivation had been carried in the former country in a comparatively short period. It would also appear to indicate an earlier date for the commencement of the West Indian ginger trade than that assigned to it by **Fluckiger & Hanbury**, who write: "It was shipped for commercial purposes from the Island of St. Domingo as early at least as 1585, and from Barbadoes in 1654. On the other hand, it corroborates the statement made by **Renny** (*Hist. of Jamaica, Lond., 1807, 154*), and quoted with doubt by those authors, to the effect that in 1547, 22,053 cwt. were exported from the West Indies to Spain.

CULTIVATION 203

Cultivation.—The plant is cultivated in all the warmer and moister parts of India, up to an elevation of 4,000 to 5,000 feet in the Himálaya. It will be seen from the accounts of the method pursued in the various Provinces, that the cultivation is one on which much care and labour are exercised. The soil must be rich, but neither too heavy, nor too light and coarse. The amount of moisture allowed to the crop requires much care; contrary to the usual custom in India except in the case of betel, and a few other expensive crops, manure is freely used; weeding is carefully and frequently carried out, and in every way ginger cultivation is much more elaborate than that of most other agricultural products.

Madras. 204

1. MADRAS.—The best Malabar ginger, spoken of so highly by Linschoten some three centuries ago, is now said to be the produce of the district of Shernaad situated to the south of Calicut. The soil of this district is peculiarly suited for the purpose, being a good rich red earth. The cultivation generally commences about the middle of May, after the ground has undergone a thorough process of ploughing and harrowing. At the commencement of the monsoon, beds of 10 to 12 feet long by 3 or 4 wide are formed, and in these small holes are dug at ¾ to 1 foot apart, which are filled with manure. The rhizomes, hitherto carefully buried under sheds, are dug out, the good ones picked from those which are affected by the moisture, etc., and cut into pieces of 1½ to 2 inches long, suitable for planting. These are then buried in the holes, and the whole of the beds are then covered with a good thick layer of green leaves, which, whilst they serve as manure, also contribute to keep the beds from unnecessary damp-

ness, which might be otherwise occasioned by the heavy rains of the monsoon. Inundation entirely ruins the crop, but as a fair supply of rain is absolutely necessary, great care is taken in draining. Strict care is observed in choosing the leaves to cover the beds, only certain kinds are chosen, since others are supposed to breed worms and insects injurious to

CULTIVATION in Madras.

Bombay. 205

acres, while Sátára in the Deccan had 87 acres under the crop. The following account describes the method followed in Thána, but is probably applicable to the whole Presidency:—The ginger which is to be used for "seed" is dug up in March and April. When the plant withers, the best roots are washed, dried in the shade, and placed in a heap on dry sugarcane and ginger leaves More of these leaves are laid above the roots, and the whole is covered with an air-tight covering of clay. They are thus preserved till the planting season, by which time they have begun to sprout. The crop requires much the same soil as sugar-cane, *viz.*, a loose, light, stoneless soil with at least one quarter of sand. The ground is used for a rice-nursery and for *náchni*, and when the *náchni* has been reaped, it is cleaned, watered, ploughed, and turned into furrows 13½

young plants are covered with grass and plantain leaves. If, on the other hand, it is planted after the rains set in, there is no need to sow hemp or *vál*, or to cover the plants with grass. The ginger garden is divided into beds, *vápha*, with a waterway between each; and in each waterway, red-pepper and turmeric are grown. When the young ginger plants are about a foot high, oil-cake manure is applied at the rate of about 5℔ to each bed, and this process is repeated in August and September. The first and second layers of manure are not covered with earth, but the third layer is. In about nine months the rhizomes are ready for gathering; they are dug up, the rind rubbed off with tiles, and, when baked and dried in the sun, the ginger is ready for use (*Bomb. Gaz., XIII, Pt. I., 292*). In the Khándesh District the manure applied is said to be equal parts of horse, cow and sheep dung. In curing, the rhizomes are first partly boiled in a wide-mouthed vessel, then after drying

to 1½ maund (of 25℔) per rupee; when dried at from 5 to 10 seers per rupee.

Bengal. 206

CULTIVATION in Bengal.

that the produce "is reckoned by the people of the neighbouring plains of Tirhoot and Sarun of very high flavour and superior to the produce of their own country." The following account of ginger-cultivation in Burdwán, taken from the *Report of the Dir., Agri. Dept., Bengal, 1886*, may be accepted as typical of the method pursued throughout the Province generally:—

Varieties. 207 Soil. 208

There is only one kind under cultivation, which, being grown under nearly the same conditions everywhere, and being propagated by buds and not by seeds, has not undergone much variation. The only SOIL on which ginger can be profitably grown is a fine sandy loam, both light coarse sand and stiff clay being quite unsuited to this crop. It is necessary that the soil for ginger should be loose. Sandy soil is loose when dry, but during the rains and after irrigation it sinks and becomes compact. Ginger does best after potatoes and *kachu* (Colocasia antiquorum, *Schott.*), but can also be grown after any of the pulses. The general principle on which the ROTATION of ginger is regulated is this:—It can be grown either after a crop which requires no irrigation, or after an irrigated crop if in the cultivation of this latter the ground had to be hoed constantly. In both cases the land is kept loose and mellow.

Rotation. 209

Tillage. 210 Planting. 211

Ploughing begins in the end of March or beginning of April. After each fall of rain the land should be ploughed once. The soil should be thoroughly pulverised, stirred to as great a depth as possible, and get well weathered. It altogether receives from 12 to 14 ploughings. The PLANTING season is in the second and third weeks of May. When the field is ready for planting, it is levelled with the ladder, after which a number of main-water channels are drawn up and down the field from 60 to 80 feet apart. Then a number of smaller water channels are drawn at right angles to the preceding ones and about 8 feet from one another. Pieces of ginger about three inches long are now planted in parallel lines which extend from one of the smaller water channels to the next one. Earth is then raised by a *kodáli* from two sides of these rows and put over the pieces of ginger to a depth of nearly 9 inches. The field now appears to be laid in ridges, the furrows between which are closed at the upper end and opened into the smaller water channels at the lower end. At certain places are planted chillies, *beguns* (Solanum Melongena, *Linn.*), and *kachus*. The ginger pieces are placed at intervals of 9 inches in the rows, which latter are 18 inches apart.

After-cultivation. 212

The plants may come out in 10 to 15 days, but sometimes take as much as two months. Throughout the rainy season every possible care is taken not to let water accumulate in the field, stagnant water being most injurious to the crop. As soon as weeds make their appearance, they should be pulled out with the *phor*. If on account of frequent heavy showers the earth sinks and the soil ceases to be friable, the field should be hoed with the *pashuni* or hoe. In the second week of September the plants are top-dressed with four maunds of oil-cake, consisting of two maunds of mustard and two of castor cakes, and then earthed up. If the field be dry, irrigation is needed in the end of October and beginning of November. If there be no rain in the cold weather, irrigation is required twice a month till the end of February or beginning of March, when the ginger is to be lifted. Four maunds of ginger are planted in one *bigha*, and the yield is from 40 to 60 maunds. At the time of ploughing, about 30 maunds of well-rotted dung is applied per *bígha* and then, as stated before, the plants are top-dressed with four maunds of oil-cake. Sometimes in the month of *Assin* (September-October) the ginger cuttings which were planted are carefully removed by the *phor*, without disturbing the rest of the plant, and sold at a high price. For this it is necessary that the cul-

Yield. 213 Manures. 214

tivators should know the ... were placed CULTIVATION in Bengal.
at the time of planting. O
maunds of ginger may be

The cost of cultivation is said to be about ... Cost. 215
represents the price of the selected ginger used as "seeds." The manure *costs about* R7, and the rest is made up by several small items representing the cost of the many operations which attend this very carefully cultivated crop. At about R2 per maund the outturn of 40 to 60 *maunds* would represent a total money value for the yield of R80 to R120, or a profit of R32 to R74 per *bigha*.

4. NORTH-WEST PROVINCES.—Ginger is extensively grown in all hot valleys in Kumáon The method is very similar to that already described in Bombay and Madras. A piece of ground not liable to be flooded is selected, and protected from excessive rainfall by trenching round the upper side. The soil is then well hoed and richly manured, and in April the ginger is planted in deep furrows. The earth is then heaped over the ... is covered with small leafy branches, preferably of North-West Provinces. 216

5. PANJÁB.—Here, as in the North-West Provinces, ginger cultivation is chiefly carried on in the lower hot valleys of the Himálaya. The selected rhizomes for planting are preserved in heaps covered with a coating of cow dung In the end of June or beginning of July the land is ploughed, Panjab. 217

ing, carminative, rubefacient, and useful in *dyspepsia*, affections of the throat, head and chest, hœmorrhoids, rheumatism, urticaria (nettle-rash), dropsy, and many other diseases. A favourite carminative remedy frequently prescribed by the older Sanskrit writers is *trikatu*, or the three MEDICINE. 218

ZINGIBER officinale.

Medicinal properties of the Ginger Spice.

MEDICINE. Rhizome. 219

acrids (see Piper longum, and P. nigrum, *Vol. VI., pp. 259, 263*). The dried RHIZOME is believed to possess all the properties of the green and to be laxative in addition. Ginger with salt, taken before meals is highly praised as a carminative, is said to purify the tongue and throat, increase the appetite and produce an "agreeable sensation." In cephalalgia and other affections of the head, ginger JUICE mixed with milk is used as a snuff, the fresh juice taken with honey is supposed to relieve catarrh, cough, and loss of appetite (*U. C. Dutt*). Many prescriptions of Chakradatta and from the *Bhávaprakásha* are translated in the *Hindu Materia Medica*, to which the reader is referred for further information. The properties ascribed to the drug by Muhammadan writers are similar. Fresh ginger is much employed as a domestic medicine, the juice with sugar or honey being prescribed for colds, coughs, and with the addition of lime-juice, in bilious dyspepsia. The juice with an equal portion of *tulsi* juice and a little honey and burnt pea-cocks' feathers is a popular remedy for vomiting in Bombay (*Dymock*).

Juice. 220

The uses of ginger in European medicine, in which it is one of the most highly valued of all mild carminatives and enters into many officinal preparations, are too well known to require mention in this work.

"The gingers at present found in the London market are distinguished as Jamaica, Cochin, Bengal, and African. Jamaica ginger is the sort most esteemed; and next to it the Cochin. Scraped or decorticated ginger is often bleached, either by being subjected to the fumes of burning sulphur, or by immersion, for a short time in a solution of chlorinated lime. Much of that seen in grocers' shops looks as if it had been white-washed, and in fact is slightly coated with calcareous matter" (*Pharmacographia*).

CHEMISTRY. 221

CHEMICAL COMPOSITION.—Mr. J. C. Thresh has very completely analysed the different gingers of commerce. He found a sample of Cochin ginger to contain:—volatile oil, 1.350; fat, wax (?) and resin, 1.205; neutral resin, .950; α and β resins, .865; *gingerol* .600; substance precipitated by acids, 5.350; mucilage, 1.450; indifferent substance precipitated by tannin, 6.800; extraction soluble in spirits of wine, not in ether or water, .280; alkaloid, a trace; metarabin 8.120; starch, 15.790; pararabin, 14 400; oxalic acid, .427. cellulose, 3.750; albumenoids, 5.570; vasculose, etc., 14.763;, moisture 13.530, and ash, 4.800 per cent. *Gingerol*, the pungent or active principle of ginger, is a viscid fluid of the consistency of treacle, of a pale straw colour, devoid of odour and with an extremely pungent and slightly bitter taste. The essential oil is of a pale straw colour, has a somewhat camphoraceous odour, and aromatic but not pungent taste, a sp. gr. of about .883 at 63° F., and is lævo-gyrate. An interesting result of Mr. Thresh's analysis was the fact that a fine selected sample of Jamaica ginger contains only about half the quantity of essential oil found in the Cochin and African samples, and less of the active principle than the African, though about as much as the Cochin gingers. Though less in quantity, however, the volatile oil of the Jamaica ginger possessed a much finer bouquet than the others (*Year-Book of Pharmacy, 1879, 1881, and 1882*).

FOOD. 222

Food.—Ginger is sold in every bazár throughout India, and is very largely employed as a condiment, especially in the preparation of curries. It is also pickled, and an excellent preserve, similar to the well known Chinese preserved ginger, is made by cooking the fresh younger rhizomes in syrup. The quality of the ginger produced in different localities varies much. Thus in Bombay three kinds of dried ginger are met with in the market, namely, Ahmadabad, which costs about R12 per cwt. Calcutta, valued at about the same, and Malabar or Cochin, which fetches more than double the price, namely, from R24 to R40 according to quality

FOOD.

in Bengal that obtained from Nepal, etc.

TRADE. 223

2,880,004lb was received from Madras, 1,288,751lb from Travancore, and smaller quantities from other sources.

It will be observed from the above that neither in the returns of external trade by rail, river, etc., nor in those of coasting trade, is there any explanation of the source from which the large foreign exports from the Madras seaports are derived. This must therefore, as in the case of cotton, be due to . from the ginger-gro

The external tr. 1808 the total qua cwt., valued at £5,629, or an average per cwt. of £2-10-2. The quinquennial average exports for the past fifteen years have been—6,691,867lb, value R9,72,853, for the period ending 1879-80; 5,421,397lb, value R8,89,016, for the period ending 1884-85; and 10,377,710lb, value R13,94,213, for that ending 1889-90. The trade suffered a large diminution during the years from 1880-81 to 1883-84, but in 1884-85 it again revived, and in 1886-87 reached a maximum of 14,927,926lb. In the follow- o 10,212,971lb, xport recorded iminution, and, , or a little over nor's statistics,

ZINGIBER officinale.

Trade in Ginger.

TRADE.

Exports. 224 shows the distribution of the exports during last year and the share taken by each Indian Presidency or Province in the trade :—

Countries to which exported.	℔	R	SHARE OF EACH PRESIDENCY OR PROVINCE.		
			Presidency or Province.	℔	R
United Kingdom	3,827,990	4,21,323	Bengal	913,352	57,351
Austria	230,434	24,655	Bombay	3,120,555	3,17,245
France	57,042	3,520	Sind	3,164	280
Germany	81,116	9,885	Madras	2,881,710	3,29,105
East Coast of Africa. Mozambique	154	14			
East Coast of Africa. Zanzibar	77,385	6,264			
East Coast of Africa. Other Ports	448	40			
United States	546,025	32,443			
Aden	811,405	81,702			
Arabia	708,682	70,844			
Ceylon	106,609	10,591			
Persia	328,198	29,591			
Turkey in Asia	121,569	11,286			
Other Countries	21,624	1,895			
TOTAL	6,918,681	7,03,981		6,918,691	7,03,981

225 **Zingiber Zerumbet,** *Roscœ; Fl. Br. Ind., VI., 247; Wight, Ic.,* [*t.* 2003.

Syn.—Z. SPURIUM, *Kön.;* AMOMUM ZERUMBET, *Willd.;* A. SPURIUM, *Gmel.*

Vern.—*Mahá bari bach, nar kachúr,* HIND. & BENG.; *Kachúr, nar-kachúr,* PB.; *Kathu-inshi-kua,* MALAY.; *Wal-ingúrú,* SING.; *Sthula granthi,* SANS.

References.—*Roxb., Fl. Ind., Ed., C.B.C., 17; also Monandrous Pl. in As. Researches, XI., 346; Voigt, Hort. Sub. Cal., 562; Thwaites, En. Cey. Pl., 315; Rheede, Hort. Mal., II., t. 13; Rumph., Amb., V., t. 64, f. 1; Pharm. Ind., 229; Ainslie, Mat. Ind., I., 492; Irvine, Mat. Med. Patna, 71; U. S. Dispens., 15th Ed., 1783; U. C. Dutt, Mat. Med. Hind., 255; Birdwood, Bomb. Prod., 88; Baden Powell, Pb. Pr., 380.*

Habitat.—Found throughout both peninsulas and Ceylon.

DYE. Rhizome. 226 **Dye.**—The RHIZOME is used as a dye (*Baden Powell*). This remark may very possibly be a mistake which has arisen out of the confusion between this species and **Curcuma Zedoaria,** *Roscœ,* the latter of which is employed in making *abír* (see Vol. II., 670).

MEDICINE. Rhizome. 227 **Medicine.**—The RHIZOME has a slightly aromatic odour and possesses similar properties to those of officinal ginger, but in a minor degree. It is employed by Natives as a "hot" remedy for coughs, asthma, "special diseases," worms, leprosy and other skin diseases (*Baden Powell*). Much of the information regarding *zerumbad,* Zerumbet, Zedoary, etc., is very confusing, since it is doubtful how much refers to this plant, and how much to **Curcuma Zedoaria,** *Roscoe* (see Vol. II., 670).

228 **ZIZYPHUS,** *Juss.; Gen. Pl., I., 3798.*

A genus of trees or shrubs which contains about fifty species, found in Tropical Asia and America and the temperate regions of both hemispheres. Of these some eighteen to twenty are natives of India.

[*t.* 282; RHAMNEÆ.

229 **Zizyphus glabrata**, *Heyne; Fl. Br. Ind, I.,* 633; *Wight, Ic.,*
Syn.—Z. TRINERVIA, *Roxb., not of Poir.*
Vern.—*Karukatá, karkattam, carékúva,* TAM.; *Kakú-pala,* TEL.; *Vatadalla,* SANS.

Hat
sula.

MEDICINE Leaves. 230 **Medicine.**—The LEAVES are employed in Southern India in decoction as a remedy to purify the blood in cases of cachexia, and as an alterative in old venereal affections (*Ainslie*).

231 **Z. Jujuba**, *Lamk.; Fl. Br. Ind., I.,*632; *Wight, Ic., t.* 99.
THE INDIAN JUJUBE, OR CHINESE DATE.
Syn.—Z. MAURITIANA, *Ham.*, Z. SORORIA, *Schult.*, RHAMNUS JUJUBA *Linn.*
Vern.—*Bér, baer, beri,* HIND.; *Kúl, bér, bór,* BENG.; *Janumjan, jom*

Badari, kola, badara, SANS.; *Sidr, nabiq, aunnabe-hindi,* ARAB.; *Kunár,* PERS.

(*XXV., Bomb Gaz.*), 49, 149, 242, 250, 279, 388; *Econ. Prod. N.-W.*

cclm.; Kángra, 22; *Central Provinces, Seonee,* 10; *Mundlah,* 88, 89; *Chundwara,* 110, *Nimar,* 306, *Chanda, App* vi., *Agri. Dept. Rep, Madras,* 1883-84, 57, *Gazetteers.—Bombay, II.,* 42, 355, 359, *IV.,* 24; *V.,* 24, 285; *VI.,* 13; *VII.,* 39, 40, 42, *VIII.,* 100, *XIII.,* 24; *XV.,* 79; *XVI,* 18, *XVII.,* 18; *XVIII,* 44; *Panjab, Déra Ismail Khan,* 19; *Jalandhar,* 4; *Muzaffargarh,* 22, *Ludhiana,* 10; *Shahpur,* 70, *Bannu,* 23, *Hazara,* 133; *Sialkot,* 11, *Rohtak,* 14; *Delhi,* 18; *Jhang,* 15; *N.-W. P., I,* 80; *III.,* 33; *IV., lxx.*; *Orissa, II.,* 153, 179; *Burma, I.,* 137; *Mysore & Coorg, I,* 50, 60; *II,* 7; *Agri.-Horti. Soc. Ind*—

ZIZYPHUS Jujuba. The Indian Jujube, or Chinese Date.

Trans., II., 1-5, 168, App., 306; VI., 48; VIII., Pro., 406; Ind. Forester, I., 273, 274; II., 175; III., 201, 238; IV., 230, 322; V., 60, 93, 212; VI., 108, 218; VII., 259, 277; VIII., 30, 82, 102, 119, 333, 373, 388, 410, 416, 438; IX., 401; X., 309; XII., 139, App., 4, 27.

Habitat.—A small tree, wild and extensively cultivated throughout India, from the North-West Frontier, Sind, and the base of the Himálaya to Ceylon, Malacca, and Burma; distributed to Afghánistán, Tropical Africa, the Malay Archipelago, China, and Australia. According to DeCandolle the great number of known cultivated races indicates an ancient domestication. Its abundance in a wild state in India and Burma, together with the number of Sanskrit and vernacular names, and the fact that botanists at an early date received it from Bengal, all point to an Indian origin. Rumphius states that it had only been recently introduced into the eastern islands of the Amboyna group, while he was living there, and ancient Chinese authors do not mention it. Its extension and naturalisation to the east of the Indian continent seems, therefore, to have been recent. It appears to have been introduced into Arabia and Egypt at a still later date, and it must have spread to Zanzibar from Asia, and by degrees across Africa, at a quite recent date (*DeCandolle, Cult. Pl., 197*).

In support of the theory of the indigenous nature of the tree in India, the writer may quote an instructive passage, which appears to have escaped the notice of later writers. In one of the earliest publications of the Agri.-Horticultural Society of India an interesting paper on the *ber* is given, written by Babu Radakant Deb, and read in April 1829. In that article we read: "According to the *Purana*, there was, in former times, a celebrated place of pilgrimage called Badarica Srama (the Badarináth of modern travellers, a town and temple on the west bank of the Alacananda river in the province of Srinagar) [in Garhwál, North-West Provinces], which abounded with the *badari* or jujube trees, and the devotees or sages of those times lived upon its fruits; whence the tree is supposed to have been introduced more generally into other parts of India." This tradition testifies at least to a very ancient knowledge of the tree and of its fruit, and points to the probability that the tree, or the knowledge of its cultivation, may, as stated, have originally spread from Northern India. Cultivation by selection and grafting has very much improved the wild jujube fruit in India, and as a natural consequence many kinds exist, which differ markedly from each other in size, shape, and flavour. The plant itself varies in size, from a shrub or very small tree to a large tree. One in the Central Provinces, carefully measured by Mr. Hooper, was found to have a girth of 16 feet 9 inches at 5 feet from the ground, and 23 feet at the base, with a height of 80 feet. [In this connection it may be added that, according to some writers, a species of Zizyphus is supposed to have been the Lotus fruit, but by others it is believed that the oblivion fruit as obtained from a species of Diospyros (*Conf. with Vol. III. pp. 136, 147, 149*).—*Ed.*]

GUM.

Gum.—Frequent reference is made in works on the products of India to a gum derived from the *bér*, but satisfactory evidence even as to its existence is wanting. In the *Bombay Gazetteer*, Vol. XV., it is stated that the BARK yields a kind of kino gum, employed in tanning and for medicinal purposes. Sir George Birdwood states that a portion of gum-gattie is derived from the tree, but on the other hand, the Catalogue of the Madras Exhibition of 1855 contains the remark that the produce is not a true gum. It appears to be most probable that the LAC which is frequently produced on the tree (see **Coccus lacca**, Vol. II., 411) may in certain cases have been inadvertently classed with gums.

Bark. 232

Lac. 233

DYE. Bark. 234

Dye & Tan.—The BARK is said to be used for tanning purposes in Northern India (*Stewart, Baden Powell, Brandis, Atkinson, Buck, etc.*),

Medicinal properties of Jujube. (*J. Murray*) ZIZYPHUS Jujuba.

Bombay (*Lisboa, & several Gazetteers*), Madras (*Beddome, Drury*), and Burma (*Kurz*). It is apparently not employed for this purpose in Bengal ... states that ... The bark, ... be given as to the percentage, nor as to the respective tanning value of the different parts. The bark is occasionally thrown into indigo fermenting vats to ... zada district of Burma the ... a reddish pink colour with ... DYE & TAN Fruit. 235 Leaves. 236

... of which nothing is known. ... ib., IV, 24) that the tree ... OIL. Kernels 237 Wax 238 MEDICINE.

... consumption, and thirs...

preserved *bér* fruit is described as capable of removing "dryness and ... Kernel. 239 Root 240 Fruit 241 Bark 242 Leaves. 243 Seeds. 244

Chemistry. 245

... are used in the form of ... promote ... *Monghy* ... bark in ... Twigs. 246

Food & Fodder.—The FRUIT of the wild *ber*, which ripens in the cold ... never ... eaten ... In the ... meal ... tion it ... long, ... unripe FOOD & FODDER. Fruit. 247

homes, it served as food for th he hed nu- ver ... FOOD & FODDER.

Leaves. 259

... and gathering them into heaps. ... alone or with some form of chaff, straw or *onusa*, and are supposed to be heating, and to promote the secretion of milk. In the *Settlement Report of the Delhi District* it is stated that camels and goats prefer this fodder to almost any other. It is said to be cut in that district twice a year in April and November, and that it sells at from 3 to 5 maunds per rupee. Mr. Coldstream states in a note to the Editor that miles of it exist in the Hissar district, and that it is so valuable as a camel and cattle f... ...that vil-

... cubic TIMBER. 260
... value except for fuel.

Domestic.—The dried BRANCHES, from which the leaves have been shaken for fodder, are much ... DOMESTIC Branches. 261

Bush. 262

Zizyphus Œnoplia, *Mill.; Fl. Br. Ind., I., 634.* 263

..., *Roxb.*; Z. CELTIDIFOLIA, *DC*; ... *Wall.*; Z. PEDICELLATA, *Wall.*; ... *Linn.*

Vern.—*Makai*, HIND.; *Siâkul, shyakûl, mahkoa*, BENG.; *Barokoli*, URIYA; *Sijâkûl, mako, bamolan*, N.-W. P.; *Irûn*, C. P.; *Paragi, paringi, parimi, paranu, porki*, TEL.; *Tawsinmé, tau-hsi*, BURM.; *Erraminya-wel*, SING.; *Srigâlakoli*, SANS.

References.—*Roxb., Fl. Ind. Ed. C.B.C.* ... *Brandis, For* ... *v., Anal. Gen.* ... *74; Dalz. &* ... *Burma & Its* ... *C. Dutt, Mat.* ... *N.-W. P., Pt.* ... *Balfour, Cyclop., III., 1130; Gazetteers:—Bombay, XV., 430; N.-W. P., I., 80; IV., lxx.; Ind. Forester, III., 201; IX., 451; Agri.-Horti. Soc. Ind., Journ. (Old Series), XIII., 320.*

Habitat.—A straggling or climbing shrub, very common throughout the hotter parts of India from the ... North-West Himálaya to ... GUM. Bark. 264

... and dyes leather red" Kino. 265
... of Z. Jujuba, applies to Lac 266
... found in it.

MEDICINE. Bark. 267 **Medicine.**—A decoction of the BARK is said to promote the healing of fresh wounds (Roxburgh).

FOOD. Fruit. 268 **Food.**—The FRUIT, which ripens in the rains, is eaten.

DOMESTIC. Shrub. 269 **Domestic.**—The prickly SHRUB is commonly used for hedges and heaped-up fences.

270 **Zizyphus oxyphylla**, *Edgew.; Fl. Br. Ind., I., 634.*

Syn.—Z. ACUMINATA, *Royle.*

Vern.—*Kurkamna*, [illegible]

References.—[illegible]

Habitat.—A thorny shrub of the Temperate Himalaya, from the Indus to the Ganges, between 2,000 and 6,000 feet; also found in Behar. Mr. Campbell includes it in his list of Economic Products of Chutia Nagpur.

FOOD. Fruit. 271 **Food.**—The FRUIT ripens in the cold season, and is eaten.

DOMESTIC. 272 **Domestic.**—It is largely used in dry-fencing in Chutia Nagpur, where it is believed not to rot so quickly as the other species of Zizyphus.

273 **Z. rugosa**, *Lamk.; Fl. Br. Ind., I., 636; Wight, Ic., t.* [illegible]

Syn.—[illegible]

Vern.—[illegible]

References.—[illegible]

Habitat.—A large, evergreen, scrambling shrub or small tree, of the Sub-Himalayan tract from Kumaon eastwards, Behar, Assam, Sylhet, Burma, Central and South India, and Ceylon.

GUM. 274 **Gum.**—Said to yield a gum, of which no information is obtainable.

MEDICINE. Bark. 275 **Medicine.**—The BARK, powdered and mixed with *ghí*, is applied to the swelling in the cheek caused by toothache, and is also given for ulcers in the mouth (*Rev. A. Campbell, Ec. Prod., Chutia Nagpur*). In Bombay it is used as an astringent in diarrhoea, and the FLOWERS with an equal

Flowers. 276 quantity of the petioles of betel leaf and half as much lime, are given in pills twice a day for menorrhagia (*Pharmacog. Ind.*).

FOOD. Fruit. 277 **Food.**—The FRUIT is eaten by Natives in all localities in which the plant grows. In Bombay it is said to be a "great support to the people of the Ghâts from March to the middle of May" (Lisboa), and was much eaten in the Poona District during the famine of 1877-78. It has a peculiar mawkish flavour.

TIMBER. 278 **Structure of the Wood.**—Reddish, moderately hard, warps, readily attacked by insects; weight 48 lb per cubic foot. It is only valuable for fuel.

DOMESTIC. Branches. 279 **Domestic.**—The BRANCHES, like those of the other species, are used to make heaped-up fences.

zyphus vulgaris, *Lamk.; Fl. Br. Ind., I., 633.* 280

THE COMMON JUJUBE; JUJUBIER, *Fr.*

Syn.—Z. FLEXUOSA, *Wall.*; Z. NITIDA, *Roxb.*; Z. SATIVA, *Gartn.*; ? Z. SINENSIS, *Lamk.*

... *shamor, sinjit, amlai, amnia, amni, amrd, imld, beri, pitni, ber, relnú,* PB.; *Karkan ber,* PUSHTU; *Ber, anab,* SIND; *Unnáb, rán-bor,* BOMB.; *Unndh,* ARAB; *Sinjid-i-jiláni, kundr,* PERS.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 204, 205; Brandis, For. Fl., 85; Gamble, Man. Timb., 88; Stewart, Pb. Pl., 42, 44; Aitchison, Rept. Pl. Coll. Afgh. Del. Com., 46; DC., Orig. Cult. Pl. ... O'Shaughnessy, ... Murray, Pl. & ... 180; Dymock, ... Pharm., 1874, ... (X., N.-W. ... 307; Ec. Prod., N.-W. P., Pt. V., 44, 54; Stocks, Rep. on Sind; P. W. Dept., Rept. on Gums & Resins, 36, 50; Cooke, Gums & Resins, 28; Settlement Reports.—Panjab, Montgomery, 17; Hazára, 94; N.-W. P., Shahjehanpur, ix.; Gazetteers.—Bannu, 23; Dera Ismail Khán, 19; Montgomery, 17; Hazára, 133; Ind. Forester, II., 175, 407, 408; XIV., 390; Smith, Ec. Dict., 115, 229.*

Habitat.—A shrub or small tree with rigid spreading boughs and stiff ... ed, in the Panjáb up to 6,500 feet, and ... rontier, occasionally cultivated as far ... DeCandolle expresses the belief that ... it is simply an escape from cultivation. "It appears to me probable," he writes, "that the species is a native of the north of China; that it was introduced and ...

GUM. 281

MEDICINE. Fruit. 282 Bark. 283 Gum. 284 Leaves. 285

CHEMISTRY. 286

TRADE. 287

... Persian fruit. The Chinese fruit is preferred, as it is larger and sweeter. Value,

Chinese, R8 per Surat maund of 27½lb; Arabian, R4 to R5" (*Pharmacog. Ind.*).

FOOD. Fruit. 288 **Food.**—The FRUIT is very similar in every way to that of Z. Jujuba, being an oval pulpy drupe about the size of a plum. It varies much, and can be greatly improved by judicious cultivation and grafting. When fresh it is rather acid, but when dried is much sweeter. The small sour fruit of the spontaneous form is also eaten by the poorer classes. The LEAVES are used for fodder.

TIMBER. 289 **Structure of the Wood.**—Very similar in structure to that of Z. Jujuba, and used for the same purposes. In France it is employed for cabinet-work, under the name of *acayou d' Afrique.*

290 **Zizyphus xylopyrus,** *Willd.; Fl. Br. Ind., I., 634.*

Syn.—Z. CARACUTTA, *Roxb.*; Z. CUNEATA, *Wall.*; Z. ELLIPTICA, *Roxb.*; Z. ORBICULARIS, *Schult.*; Z. RUMINATA, *Ham.*; Z. ROTUNDIFOLIA, *Roth.*; RHAMNUS XYLOPYRUS, *Retz.*

Vern.—*Kat-ber, béri, goti, gotha, kakor, chittania, sitabér, ghónt,* HIND.; *Karkatta,* KOL; *Karkat,* SANTAL; *Got, gotobóro, kanta bóiul,* URIYA; *Goit,* BHUMIJ; *Kankor,* KHARWAR; *Katber,* BERAR; *Ghota,* MELGHAT; *Ghato, ghouti,* C. P.; *Ghattil ghotia,* GOND; *Ghunt,* N.-W. P.; *Ghot, sêti,* BOMB.; *Goti, bhorgoti, kánte gotti, guti,* MAR.; *Goti, gotte,* TEL.; *Challe, mullu káre,* KAN.

References.—*Roxb., Fl. Ind., Ed. C.B.C., 205, 206; Brandis, For. Fl., 90; Beddome, Fl. Sylv., Anal. Gen., lxxiii.; Gamble, Man. Timb., 90; Thwaites, En. Ceyl. Pl., 74; Dalz. & Gibs., Bomb. Fl., 49; Rev. A. Campbell, Rep. Ec. Pl., Chutia Nagpur, No. 7531; Elliot, Fl. Andhr., 63; Atkinson, Him. Dist., 307; Drury, U. Pl., 459; Lisboa, U. Pl. Bomb., 50, 242, 278; Birdwood, Bomb. Pr., 342; Buck, Dyes & Tans, N.-W. P., 85; Liotard, Dyes, 33, 36; Settle. Rep., Seonee, 10; Gazetteers:—Mysore & Coorg, I., 50; Bombay, XIII., 24; XV., 79; N.-W. P., I., 80; IV., lxx.; Agri.-Horti. Soc. Ind., Trans., VI., 43; Jour. (New Series), VI., Sel., 18; Ind. Forester, I., 274; III., 201; IV., 223, 233, 318; VIII., 417; IX., 401; X., 222; XII., App., 10; XIII., 120.*

Habitat.—A large, straggling shrub or small tree, found in North-West India, Nepál, Banda, Rájputána, and Oudh, ascending the Himálaya to 2,000 feet; also in Behar, the Western Peninsula from the Konkan southwards, and in Ceylon.

TAN. Berry. 291 Bark. 292 **Tan.**—"The BERRY contains a considerable amount of tannin; the BARK is also used in Bundelkhand as a tanning agent in company with the leaves of the *dha* shrub," Woodfordia floribunda, *Salisb.* (*Sir E. C. Buck*). They are similarly employed in Chutia Nagpur, Bombay, and other parts of India.

FOOD & FODDER. Kernels. 293 Shoots. 294 Leaves. 295 Fruit. 296 **Food & Fodder.**—The pulp of the fruit is not eatable, but the KERNELS, which taste like filberts, are eaten by Natives (*Roxburgh*). The young SHOOTS, LEAVES, and FRUIT are eaten by cattle and goats.

TIMBER. 297 **Structure of the Wood.**—Yellowish-brown, hard, tough, heart and sap-wood not distinct; weight 60lb per cubic foot (*Skinner*), 49lb (*Gamble*). It is durable and easily worked; used for cart-building and making agricultural implements, and for torches.

DOMESTIC. Bark. 298 Charred Fruit. 299 **Domestic.**—The BARK and CHARRED FRUIT, especially the latter, are largely employed in making a blacking, or black-dye for leather.

ZORNIA, *Gmel.; Gen. Pl., I., 518.*

300 **Zornia diphylla,** *Pers.; Fl. Br. Ind., II., 147.*

Syn.—Z. ANGUSTIFOLIUM, *Smith*; Z. DICTYOCARPA, *DC.*; Z. GIBBOSA & GRAMINEA, *Spanoghe*; HEDYSARUM DIPHYLLUM, *Linn.*

Var. zeylonensis=Z. ZEYLONENSIS, *Pers.*; Z. CONJUGATA, *Smith*; HEDYSARUM CONJUGATUM, *Willd.*

Var. Walkeri, *Arn. Pug.* (*sp*).

Vern.—*Tandi jhapni, bir moch,* SANTAL; *Nelam mari,* MALAY.

, Dals & Gibs., Bomb.
, Ec. Prod , Chutia Nag-
IX , t. 82 , Gazetteers:—

Habitat.—A very common annual throughout the plains of India from the Himálaya to Ceylon and Burma, ascending to 4,000 feet in Kumáon.

Medicine.—" The ROOT is given, along with that of *bhadar jhapni,* to induce sleep in children. These plants shutting up their leaves at night have probably suggested the idea to the *Ojhas*" (*Campbell, Ec. Prod., Chutia Nagpur*). MEDICINE. Root. 301

ZYGOPHILLUM, *Linn.; Gen. Pl., I., 266, 988.*

Zygophillum simplex, *Linn.; Fl. Br. Ind., I., 424;* ZYGOPHYLLEÆ. 302

Vern.—*Alethi,* PB.; *Alethi, putlani,* SIND.

References.—*Stewart, Pb. Pl., 38; Murray, Pl. & Drugs, Sind, 92.*

Habitat.—A prostrate, much-branched herb of the arid, sandy tracts in Sind and the Panjáb.

Medicine.—The Arabs beat up the LEAVES in water and apply the infusion to the eyes in ophthalmia, etc. MEDICINE. Leaves. 303

Food & Fodder.—The SEEDS are swept up from the ground by the nomad tribes of the Panjáb and Sind deserts and used as food under the above name. Stocks states that camels are very fond of the PLANT, and eat it greedily; but it is said to have such an offensive odour that no other animal will touch it. FOOD & FODDER. Seeds. 304 Plant. 305

A

DICTIONARY

OF

THE ECONOMIC PRODUCTS OF INDIA.

BY

GEORGE WATT, M.B., C.M., C.I.E.,
REPORTER ON ECONOMIC PRODUCTS WITH THE GOVERNMENT OF INDIA.
OFFICIER D'ACADEMIE; FELLOW OF THE LINNEAN SOCIETY, CORRESPONDING MEMBER OF THE ROYAL HORTICULTURAL SOCIETY, ETC., ETC.

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